



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

June 11, 2014

MEMORANDUM TO: ACRS Members

FROM: Maitri Banerjee, Senior Staff Engineer **/RA/**
 Technical Support Branch
 Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFIED MINUTES OF THE ACRS ADVANCED BOILING
 WATER REACTOR SUBCOMMITTEE MEETING ON APRIL 9,
 2014

The minutes of the subject meeting were certified on June 11, 2014, as the official record of the proceedings of that meeting. Copies of the certification letter and minutes are attached.

Attachments: As stated

cc: C. Santos
 E. Hackett



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

MEMORANDUM TO: Maitri Banerjee, Senior Staff Engineer
Technical Support Branch
Advisory Committee on Reactor Safeguards

FROM: Michael Corradini, Chairman
ABWR Subcommittee

SUBJECT: CERTIFIED MINUTES OF THE ACRS ADVANCED BOILING WATER
REACTOR SUBCOMMITTEE MEETING ON APRIL 9, 2014

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting held on April 9, 2014, are an accurate record of the proceedings for that meeting.

/RA/

June 11, 2014

Michael Corradini, Chairman
ABWR Subcommittee

Date

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
 MINUTES OF THE ABWR SUBCOMMITTEE MEETING ON APRIL 9, 2014**

The ACRS ABWR Subcommittee held a meeting on April 9, 2014 in Room T2B1, 11545 Rockville Pike, Rockville, Maryland. The meeting convened at 8:30 a.m and adjourned at 11:37 a.m.

The entire meeting was open to the public. No written comments or requests for time to make oral statements were received from members of the public related to this meeting.

ATTENDEES

<p><u>ACRS Members/Consultants/Staff</u></p> <p>Michael Corradini, Chairman John Stetkar, Member Charlie Brown, Member Ronald Ballinger, Member Peter Riccardella, Member Michael Ryan, Member Dennis Bley, Member W. Hinze, Consultant M. Banerjee, ACRS Staff (DFO)</p> <p><u>NRC Staff</u></p> <p>Tom Tai, NRO/DNRL Tekia Govan, NRO/DNRL J Frankie Vega, NRO/DSEA Sarah Tabatabai, NRO/DSEA Christopher Cook, NRO/ DSEA Dan Barss, NSIR Raul Hernandez, NRO/DSRA Yong Li, NRR/DE/EMCB Rebecca Karas, NRO/DSEA Mike Tacs, NRO/DSEA Chang-Yang Li, NRO/DSRA</p>	<p><u>NRC Staff</u></p> <p>John McKirgan, NRO/DSRA Rocky Foster, NRO/DNRL Charles Murray, NSIR Bruce Musico, NSIR Eileen McKenna, NRO/DSRA Amanda Marshall, NSIR Dinesh Taneja, NRO/DE Ronaldo Jenkins, NRO/DNRL Eugene Eagle Jr., NRO/DE Antonio Dias, NRO/DSRA Yiu Law, NRO/DE Lisa Walsh, NRO/DSEA</p> <p><u>Other Attendees</u></p> <p>Scott Head, NINA Joe Litehiser, Bechtel Corp Richard Scheide, NINA Harry Moate, Bechtel Corp Dale Wuokko, TANE Al Gutterman – Morgan Lewis Brian McDonald, Exponent</p>
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SUMMARY

The purpose of the meeting was to review Section 2.5S, “Geology, Seismology, and Geotechnical Engineering,” of the Combined License Application (COLA) submitted by the Nuclear Innovation North America (NINA) for South Texas Project (STP) Units 3 and 4, and the

associated NRC safety evaluation report (SER). Also reviewed were NINA's response to three of the Fukushima Near-Term task Force recommendations in FSAR Appendix 1E, "Response to NRC Post-Fukushima Recommendations," and NRC SER in Chapter 22, "Requirements Resulting from Fukushima Near-Term Task Force Recommendations." Particularly, three of the recommendations dealing with Seismic and Flood Hazard (item 2.1), Spent Fuel Pool Instrumentation (7.1), and Emergency Preparedness Regulatory Actions (9.3) related to staffing and communications were subjects of this briefing. Additionally, NRO staff and NINA presented their response to several ACRS action items resulting from prior ABWR Subcommittee meetings comprising of questions from the members and the ACRS consultant. The meeting transcript and presentation slides are attached. A summary of this review and discussion are presented below:

SIGNIFICANT ISSUES	
Issues	Reference Pages in Transcript/slides
Subcommittee Chairman Corradini opened the meeting and introduced the members attending.	P4
Scott Head, NINA, introduced the NINA presenters, staff and consultants attending the meeting, and issues to be discussed.	P7
Mr. Head addressed resolution of the open items in the previous staff SER Section 2.5. The staff was concerned about the potential for previously unmapped growth faults existing immediately beneath the proposed STP Units 3 and 4 to cause deformation at the site. This concern was addressed via a license condition requiring the applicant to perform detailed geologic mapping of the excavations for the Units 3 and 4 nuclear island structures, evaluate geologic features discovered in excavations for safety-related structures, and notify NRC.	P8-11 NINA Slide 6
Mr. Head discussed resolution of staff concern on unknown backfill sources and property via an ITAAC. The backfill ITAAC is to confirm that the engineering properties of the backfill materials are bounded by the assumed values, with the required testing frequency.	P11-12 NINA Slide 7
Mr. Head discussed how NINA addressed the Fukushima Recommendation 2.1, the CEUS report, and reevaluated the seismic hazard by doing the probabilistic seismic hazard analysis (PSHA). Member Stetkar asked if the uncertainties in the FSAR seismic hazard curves are appropriately accounted for in that the uncertainties should be higher at higher accelerations. STP seismic hazard curves show modest uncertainty and not an increasing uncertainty at higher accelerations. He	P12-33, 37, 43 NINA Slides 8, 9

<p>was concerned that the STP 3&4 GMRS curve may not be correctly calculated. Same trend was noted in hazard curves in NUREG 2115. A long discussion followed, and this was taken as an action item for future follow up.</p>	
<p>Consultant Hinze noted in FSER Table 2.5.2-3, "Updated Maximum Magnitude (Mmax) Distributions (mb) for the Gulf Coast Seismic Source Zones," the Technical Integrator's spread of seismic hazards in the Gulf Coast seismic zone was modified to final values less than the TI team's magnitudes. Mr. Head noted, that was the consensus of the SSHAC probabilistic process, which resulted in curves with less than three percent difference at the maximum.</p>	<p>P29-33, 36-37</p>
<p>Consultant Hinze noted that Section 8 of NUREG 2115 prohibits use of the test site calculations for design or analysis of any engineered facility. Mr. Head stated that the information from the test site was used as a confirmatory assessment and not as part of any design analysis.</p>	<p>P33-36</p>
<p>Fukushima Recommendation 7.1, Spent Fuel Pool Instrumentation – Design and operational details were discussed.</p>	<p>P38-41 NINA Slides 11,12</p>
<p>Fukushima Recommendation 9.3, Emergency Plan Staffing and Communication – related ITAAC was discussed. Use of a license condition in lieu of an ITAAC was mentioned.</p>	<p>P41-43 NINA Slides 14-15</p>
<p>Ms. Tekia Govan presented the scope of the staff briefing and a quick summary of the staff's review of Section 2.5.</p>	<p>P43-46 NRO Slides 2-4, "SER..Chapter 2.5"</p>
<p>Mr. Li outlined the license condition in SER 2.5 related to mapping of the excavation surfaces. Extent of the excavation in relation to the nuclear island was discussed.</p>	<p>P46-49 NRO Slides 6,7, "SER..Chapter 2.5"</p>
<p>Mr. Li also presented the staff response to ACRS Action Item 96 related to the ability of the best available techniques to provide useful information regarding the presence and nature of growth faults in the STP 3 & 4 area of concern. A detailed discussion of the growth fault definition, detection methods, mapping, surface expression, expected behavior and moving rates followed.</p>	<p>P49-70 NRO Slides 8-23, "SER..Chapter 2.5"</p>
<p>Upon Member Bley's question regarding the location of the main cooling reservoir related to the Beaumont Formation it was pointed out that the MCR is a "perched" pond.</p>	<p>P66-67 NRO Slides 20-22, "SER..Chapter 2.5"</p>

<p>Consultant Hinze noted a couple of inconsistencies in the staff SER that were considered typographical.</p>	<p>P70-71</p>
<p>Consultant Hinze asked if the staff had evaluated any possible increase in the plus 3 magnitude earthquakes in the vicinity of the site, as a result of human activities related to increased fluid injection into the subsurface during the process of “fracking.”</p>	<p>P71-81</p>
<p>Mr. Frankie Vega, NRO presented how staff closed out the SER open item related to backfill material.</p>	<p>P82-84 NRO Slides 26, 27, “SER with no OIs Chapter 2.5 .”</p>
<p>Mr. Tom Tai, NRO, described the staff review of how Fukushima Recommendations 7.1, and 9.3 were addressed in STP COLA.</p>	<p>P87-90 NRO Slides 1-7, “SER Phase 4 Chapter 22 ...”</p>
<p>Ms. Sarah Tabatabai, NRO, presented staff review of Fukushima Recommendations 2.1 implementation and how the impact of CEUS-SSC model (NUREG-2115) was evaluated. She addressed ACRS Action Item 97 related to the impact of the new seismic source model on the results obtained using the EPRI SOG model. She discussed how Houston Test Site was used as an adequate substitute for performing the hazard at the STP site and staff’s confirmatory analyses to confirm adequacy of the approach.</p>	<p>P90-113 NRO Slide 8-21, “SER Phase 4 Chapter 22 ...”</p>
<p>Member Stetkar asked about uncertainties related to the hazard curves, and the treatment of uncertainties in NUREG-2115, specifically referring to the Houston site. A long discussion took place regarding modeling uncertainties. Staff explained the observation as an artifact of the level of hazard and seismicity in the region and truncated curves. Members discussed generic vs STP specific aspect of the observation. This issue needs to be addressed.</p>	<p>P100-117</p>
<p>Dr. Christopher Cook, NRO, discussed the staff response to ACRS Action Item 106 regarding uncertainties involved in the dam failure analyses. He discussed how the staff interim guidance was developed, and how it addressed the failure modes, industry guidance and uncertainties. Upon Consultant Hinze’s question, Dr. Cook explained how critical dams are identified. Member Stetkar asked if instead of assuming flood coincident with earthquakes, the applicants could be asked to do a comparable assessment of their dams for the site specific seismic hazard similar to the seismic margin analysis to indicate the overall high confidence low probability of failure (HCLPF) plant capacity. Dr. Cook discussed the challenges involved. This issue is resolved.</p>	<p>P119-141, NRO Slides 1-8 titled “Updated Guidance for Assessment of Flooding Hazards due to Dam Failure”</p>

<p>Consultant Hinze asked if staff was planning any research into developing a more unified theory of breaching. Dr. Cook noted a larger research plan in development in collaboration with the NRC Office of Research.</p>	P138-141
<p>Chairman Corradini sought out comments from the public physically present in the room and over the telephone bridge line. None was offered.</p>	P142
<p>Chairman Corradini asked consultant Hinze and ACRS members for comments, and the following was offered:</p> <ul style="list-style-type: none"> • The need for being very careful about growth faults and mapping of them; • Use of the CEUS study was noted as a natural progression of requirements of the Fukushima Near-Term task force recommendations. 	P143-144
<p>Chairman Corradini summarized the follow-up item from the briefing to be as follows:</p> <ul style="list-style-type: none"> • Clarification of the methodology NINA used to generate the GMRS regarding expectation that the uncertainty would broaden with frequency and acceleration; and • The generic implication of the above for the methodology in NUREG-2115. 	P145-146
<p>ACRS Action Items 96 on the growth faults, 97 on the seismicity, and 106 on dam failures were closed.</p>	P141, 145, 146
<p>Chairman Corradini thanked the applicant and the staff and adjourned the meeting at 11:37 a.m.</p>	P146

Documents provided to the ABWR Subcommittee

Following documents were provided to the subcommittee members in preparation for this meeting are as follows:

1. Staff Advanced SER without Open Items for Section 2.5 (ML13360A133)
2. STP3&4 FSAR Section 2.5S, Geology, Seismology, and Geotechnical Engineering
3. Staff SER 22.0, Requirements Resulting from Fukushima Near-term Task Force Recommendations (sans Recommendation 4.2) (ML14059A016)
4. STP3&4 FSAR Appendix 1E, Response to NRC Post-Fukushima Recommendation, Revision 10
5. February 2014 ACRS Meeting P&P input, "STP COLA and Staff SER Revision - Section 13.3 Emergency Preparedness (EP) and Section 13.4S, Operational Program Implementation"
6. STP COLA Part 9, Inspections, Tests, Analyses, Acceptance Criteria, Rev. 10
7. JLD-ISG-2013-1, "Guidance For Assessment of Flooding Hazards Due to Dam Failure,"

Official Transcript of Proceedings
NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
 ABWR Subcommittee

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, April 9, 2014

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
+ + + + +
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
(ACRS)
+ + + + +
ABWR SUBCOMMITTEE
+ + + + +
WEDNESDAY
APRIL 9, 2014
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ROCKVILLE, MARYLAND
+ + + + +

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

COMMITTEE MEMBERS:

MICHAEL L. CORRADINI, Member
DENNIS C. BLEY, Member
CHARLES H. BROWN, JR. Member
Ronald Ballinger, Member
PETER RICCARDELLA, Member
MICHAEL T. RYAN, Member
JOHN W. STETKAR, Member

1 ACRS CONSULTANT:

2 WILLIAM HINZE

3 DESIGNATED FEDERAL OFFICIAL:

4 MAITRI BANERJEE

5 ALSO PRESENT:

6 SCOTT HEAD, NINA

7 JOE LITEHISER, Bechtel Power Corporation

8 DICK SCHEIDE, NINA

9 NRC STAFF:

10 CHRISTOPHER COOK, NRO

11 REBECCA KARAS, NRO

12 YONG LI, NRO

13 TEKIA GOVAN, NRO

14 SARAH TABATABAI, NRO

15 TOM TAI, NRO

16 FRANKIE VEGA, NRO

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

(8:30 a.m.)

1
2
3 CHAIRMAN CORRADINI: Okay, the meeting
4 will come to order. This is a meeting of the Advanced
5 Boiling Water Reactor, ABWR Subcommittee for the ACRS.
6 My name is Mike Corradini. I'm chair of the
7 subcommittee.

8 Currently, ACRS members in attendance are
9 Charlie Brown, John Stetkar, Mike Ryan, Ron Ballinger,
10 and soon to be Dennis Bley. Our consultant is Dr. Bill
11 Hinze. We also have Ms. Maitri Banerjee as our
12 designated federal official for the meeting.

13 And as announced in the Federal Register
14 on April 1st, 2014, the subject for today's briefing
15 is Section 2.5 of the COL application submitted by
16 Nuclear Innovations of North America, or NINA, for the
17 South Texas Project Units 3 and 4, as well as the staff's
18 final SER.

19 Section 2.5 deals with geology,
20 seismology, and geotechnical engineering aspects of
21 the site. What will also be discussed is NINA's
22 response to three of the Fukushima Near-Term Task Force
23 recommendations dealing with seismic and flood
24 hazards, spent fuel pool instrumentation, and

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1 emergency preparedness regulatory actions related to
2 staffing and communications.

3 The rules for participation in today's
4 meeting were announced in the Federal Register which
5 the notice was posted April 1st. It stated that
6 portions of the meeting could be closed to the public
7 to discuss proprietary information. However, since
8 that time the staff has informed me the entire meeting
9 will be open to the public. We have a telephone bridge
10 line for the public and stakeholders to hear the
11 deliberations.

12 To minimize disturbances, the line will be
13 kept in the listen-only mode until the end of the
14 meeting when we'll provide ten minutes for public
15 comment. At that time, any member of the public
16 attending this in person or on the bridge line can make
17 statements and provide comments as desired. We'll
18 check on this as we get close to the end to see if there
19 are individuals on the line.

20 As the meeting is transcribed, I request
21 that participants in this meeting use microphones
22 located throughout the room when addressing the
23 subcommittee. Participants should first identify
24 themselves and speak with sufficient clarity and volume

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1 so that they can be readily heard. And also, please
2 silence all cell phones, pagers and other appliances
3 of various types and shapes so that we can proceed
4 without noises.

5 Let's proceed with the meeting. I'll call
6 upon Tom Tai -- where's Tom? Then I'll order to begin
7 the presentation. Tom?

8 MR. TAI: Good morning. My name is Tom
9 Tai, a DPM for STP.

10 CHAIRMAN CORRADINI: Do you need to tell
11 us anymore?

12 MR. TAI: Oh no, I thought you were
13 planning something else.

14 In addition to Chapter 2.5 in Fukushima,
15 three section of Fukushima, we also want to talk to you
16 about the action item 96-97 which is part of the 2.5
17 presentation, and Dr. Christopher Cook will be talking
18 about action item 106 after the Fukushima presentation.

19 CHAIRMAN CORRADINI: All right, thank
20 you. Just to remind -- by the way, we had Pete
21 Riccardella join us. Good morning, Dr. Riccardella.

22 Just for the subcommittee, since this has
23 gone on over a number of years we've tried to capture
24 this by listing some of the things that NINA and staff

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1 were going to come back to us and clarify. So those
2 were the numbers that Tom was referring to as some
3 previous discussions we had in past subcommittee
4 meetings.

5 Anything else you want to say, Tom?

6 MR. TAI: No.

7 CHAIRMAN CORRADINI: So we'll turn it over
8 to Scott.

9 MR. HEAD: Yes, sir.

10 CHAIRMAN CORRADINI: Okay, Mr. Head, it's
11 all yours.

12 MR. HEAD: Thank you very much for the
13 opportunity to brief the ACRS in these topics. Just
14 a couple of intro remarks on this page. We are going
15 to talk about a couple of items from the Section 2.5,
16 and in that we'll discuss the CEUS evaluation that we
17 did, and then moving down with respect to the Fukushima
18 recommendations.

19 So I'm just going to call this, in many
20 ways, the first Fukushima ACRS that we're going to
21 brief you or meeting with you, and we expect to have
22 another one in September to address NINA's response to
23 the Fukushima recommendations.

24 So the agenda for today is we're going to

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1 talk about a license condition on geomapping and then
2 an open item regarding a backfill. We discussed these
3 in some details at the last time we met, and this really
4 will just be, you know, the fact that we've closed these
5 now by updating the COLA.

6 We are going to discuss assessment of the
7 CEUS and recent seismic source characterization
8 information that's been available to us. And then
9 we'll talk about spent fuel instrumentation and the
10 enhanced emergency plan staffing and communications.

11 Attendees today, myself, Dick Bense, Dick
12 Scheide. We have Brian McDonald, exponent
13 engineering, and Joe Litehiser from Bechtel, here today
14 to assist us in this briefing.

15 Haven't been in awhile, a picture of the
16 site. Obviously, you know, water is a prominent part
17 of the site picture and we've discussed this in some
18 details. Included this picture because it does show
19 the excavation. It's a pretty interesting view of what
20 the excavation is expected to look like, and we'll be
21 talking about backfill in a second.

22 The first topic is geological mapping of
23 open excavation (sic). This is a commitment regarding
24 actions we would take as we opened up the excavation,

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1 and then finally inform the NRC when the excavation was
2 complete and so they could come in and perform their
3 own assessment.

4 There's a process for doing that for both
5 us and for what the staff would be doing. And this
6 commitment has ultimately been captured as part of a
7 license condition, and actually it's an activity that
8 we would expect to perform and as we perform the
9 excavation.

10 MR. HINZE: Could I ask a question related
11 to that Scott?

12 MR. HEAD: Sure.

13 MR. HINZE: What about the excavations for
14 the piping and other excavations on the property? Will
15 there be a geoscientist from your group that will be
16 looking at the possibility of other features that might
17 be of interest?

18 MR. HEAD: Piping? You mean like --

19 MR. HINZE: Well, any underground
20 facilities.

21 MR. HEAD: Let's go back to the picture.
22 Well, you see the area that comes down towards the main
23 cooling reservoir? Well, that's the circ water. That
24 will be where the circ water piping would be laid out.

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1 And I believe most of the rest of the excavation will
2 already be there and be available for us to walk through
3 and assess.

4 So is there some other --

5 MR. HINZE: No, it's obviously a very good
6 idea to do what you're planning to do and what the staff
7 has asked you to do, but I'm asking if there are other
8 excavations that you plan to make as a result of the
9 construction activities, and will you be looking at for
10 similar types of features?

11 CHAIRMAN CORRADINI: Are you going to dig
12 anywhere else is what he's asking. And once you dig
13 are you going to look?

14 MR. HEAD: Well, there's a couple of other
15 digs I can tell you about. One is the slurry wall,
16 okay, but that's basically fill as you dig, and that's
17 to prevent ground water coming back into the
18 excavation.

19 CHAIRMAN CORRADINI: Where is that? Does
20 that occur along the trench?

21 MR. HEAD: No, that'll occur all the way
22 around the excavation, okay.

23 MEMBER STETKAR: Ground water's pretty
24 high here.

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1 MR. HEAD: Yes. And then there's the
2 crane wall that we're going to excavate, and that'll
3 be a trench. And not to my knowledge do we have any
4 plans to send someone down --

5 MEMBER STETKAR: But just for everybody,
6 that's all within the ground footprint on this --

7 MR. HEAD: That's what I thought. Yes,
8 sir. So I believe in terms of an assessment of what
9 could be happening at the site, I think this excavation
10 and that footprint is probably going to address it.
11 I'm not aware of any other "excavations" that would be
12 relevant to what, you know.

13 MR. HINZE: Well, it would be just be a
14 good idea, as you say, look if you dig.

15 MR. HEAD: Sure. Any other questions on
16 this? Okay. And the next one, as we mentioned last
17 time, is a couple of years ago we had not defined the
18 backfill source. And as you've probably seen, we have
19 a rather large amount of backfill we're going to need
20 and so it may be source or sources and it may be
21 something that evolves over time.

22 So not knowing the source and the
23 properties, we and the staff agreed to define what the
24 backfill properties needed to be and that we would

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1 assess their adequacy and document that adequacy,
2 ultimately, in part of a closure of an ITACC. And it
3 includes all the appropriate design properties
4 including shear wave at the appropriate places to
5 defining that the backfill we're using is adequate for
6 these purposes. Any questions on that?

7 Okay, and then regarding Fukushima
8 Recommendation 2.1 which is the CEUS discussion, we had
9 finished our initial work regarding the ground motion
10 response spectrum and defining that as part of the PSHA
11 back in 2010.

12 We were obviously aware that there was
13 other work going on in the industry and monitored that
14 and, you know, made sure we knew, just had a vision of
15 how we would react to that. The 3 & 4 GMRS was based
16 on updated information and we did use a SSHAC Level II
17 process to assess that updated information, and just
18 to give us an overall view of the information that we
19 had to make sure that our analysis was meeting current
20 standards and was adequate.

21 And so that was all part of our original
22 effort. NUREG 2115 was issued in December 2011, and
23 we immediately determined or tried to attempt to figure
24 out how were we going to use this information with

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1 respect to our previous analysis.

2 And so our thought was that, you know, we
3 had done a SSHAC Level II process, and in the NUREG
4 there was a test site, if you will. It was Houston.
5 And we believe that the Houston site was something that
6 was certainly available to us to use in terms of a
7 sensitivity analysis.

8 And what we did is we confirmed that
9 Houston and STP site were close enough in terms of their
10 seismic characteristics both from a background seismic
11 source and from the fact that from the large earthquake
12 potential, New Madrid, that STP was further away from
13 New Madrid.

14 So in essence, what we did is we moved the
15 site soil to Houston. Used the Houston results from
16 the CEUS test study, and concluded that our GMRS was,
17 in fact, adequate and therefore that the SSE, the design
18 basis SSE was conservative.

19 Since that time, and we made us some
20 little, you know, documenting that sensitivity
21 analysis and were prepared to discuss that last year
22 at some point in time. Since that time the ground
23 motion model has also been provided to the industry and
24 we've assessed that, and then our conclusions remain

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1 valid regarding our original GMRS and the SSE.

2 So here's a diagram of what I just described.
3 The top black line we put on there just to show you what
4 the DCD, you know, curve is. The light blue line is
5 the STP Units 3 & 4 site-specific SSE that we defined
6 as part of the process back in 2010, and the STP 3 &
7 4 FSAR GMRS is the dotted blue line. Now our
8 approximated assessment that I just described by using
9 the Houston site is represented by the four blue dots,
10 or four blue squares, and that was the basis for our
11 conclusion that the original GMRS was still adequate,
12 and certainly that our original SSE for 3 & 4 maintains
13 was adequate.

14 And as I mentioned, we have also, and we
15 docketed this, and as I mentioned we've since looked
16 at the impact of the ground motion model, and our
17 results remain valid regarding our original
18 conclusions.

19 Well, let me stop there now and see what
20 questions we might --

21 CHAIRMAN CORRADINI: John?

22 MEMBER STETKAR: Yes, thank you. I don't
23 remember whether I attended whenever we discussed
24 seismic stuff last, but that's okay.

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1 You showed the GMRS. I went back and I
2 looked at the actual hazard curves in the FSAR, and I
3 was struck by the observation that the uncertainties
4 in the seismic hazard are A, modest, and B, rather
5 constant over a range of accelerations from somewhere
6 around the order of 0.02G up to about 1G, which is kind
7 of contrary to what our experience generally is.

8 I can understand rather modest uncertainties at
9 low accelerations because we have quite a bit of data
10 of small earthquakes. We don't have a lot of data for
11 large earthquakes or characterizing the sources of the
12 large earthquakes in the relationship to the site.

13 And when I looked at the resulting hazard
14 curves, which are in Figures 25S.2-18 through 24 for
15 various spectral frequencies, and then I looked at the
16 six sets of expert estimates that are plotted in Figures
17 25S.2-14 and 25S.2-15, S.2-15, that are the experts'
18 mean, I guess, or best estimates or how ever they're
19 characterized, I did see the expected divergence as you
20 increased in acceleration.

21 So I was curious why is there only modest
22 uncertainty and not an increasing uncertainty as we go
23 to other high accelerations especially for this site?
24 Now the reason I asked that is that if you do the process

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1 correctly, the mean hazard curve is derived from the
2 uncertainties it's not vice versa. And the mean hazard
3 curve defines your GMRS.

4 CHAIRMAN CORRADINI: Which line?

5 MEMBER STETKAR: Any of them.

6 CHAIRMAN CORRADINI: So you're talking
7 the dotted blue?

8 MEMBER STETKAR: Oh, dotted blue or the
9 solid blue. The solid blue is what you derive, right?

10 MR. HEAD: The solid blue is what we chose
11 as the SSE.

12 MEMBER STETKAR: Yes, but you chose that
13 based on --

14 MR. HEAD: The dotted blue. It abounds
15 the dotted blue.

16 MEMBER STETKAR: Oh, okay. Well, oh, the
17 solid blue is just something you selected.

18 MR. HEAD: Yes, sir.

19 MEMBER STETKAR: But the dotted blue is
20 derived from your actual site-specific hazard
21 analysis.

22 MR. HEAD: Yes, sir.

23 MEMBER STETKAR: So the dotted blue is
24 ostensibly the mean. You take slices, you know, and

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1 the mean ought to be derived from the uncertainty
2 analysis. In fact, in some cases I see, for example,
3 the mean of the curve converging with the median at
4 higher accelerations which is a good indication.

5 These things tend to be sort of log normal type
6 plots, and they're not exactly log normal for this site
7 but they're close enough, which tends to mean that the
8 uncertainty is reducing as you get to higher
9 accelerations rather than getting larger.

10 So it's very, very curious and I was
11 wondering if anybody had an explanation for why that
12 is. Because I'm not, you know, I'm not a seismologist.
13 I'm not somebody who derives the seismic hazard curves.
14 I'm somebody who's used a lot of them but, so I have
15 no idea what element of the calculation process is
16 causing this especially when I look at the individual
17 experts who ostensibly went into that, you know, were
18 input to that process, when their estimates do indeed
19 diverge as you get to higher accelerations.

20 MR. HEAD: Okay. I'm going to ask Joe, if
21 you could --

22 MR. LITEHISER: Yes, I guess I need to
23 understand which figure you're looking at within this.

24 MEMBER STETKAR: Okay, pick any.

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1 MR. HEAD: Joe, could you give us a little
2 background first, please?

3 MR. LITEHISER: Oh, sorry. Yes, my name
4 is Joe Litehiser. I've been with Bechtel since 1974.
5 I think Professor Hinze and I may be the only two people
6 in the room here who were involved directly with the
7 EPRI Seismic Owners Group exercise which provided the
8 fundamental basis for the seismic source
9 characterization of the Central Eastern U.S. until the
10 more recent updates we've been talking about, the 2115
11 NUREG.

12 I've been working with the South Texas
13 Project for a number of years and we started with the
14 EPRI SOG. And I'm thinking of maybe the six experts
15 you're talking about, is that the EPRI SOG data going
16 back to the '70s or early '80s?

17 MEMBER STETKAR: Yes, that's right. But
18 it's my understanding that some of their estimates were
19 kind of updated based on the new seismic sources, so,
20 you know, they're characterized in the FSAR. They're
21 Bechtel, Dames & Moore, Law, Rondout, Woodward-Clyde,
22 and Weston.

23 So they were the six from the SOG work, and
24 it's my understanding that some of their estimates were

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1 basically updated, if I can use that --

2 MR. LITEHISER: No, absolutely.

3 MEMBER STETKAR: -- based on the new
4 seismic sources and new information. But that being
5 said, these curves in the FSAR are the product of that
6 updating. It's my understanding.

7 MR. LITEHISER: That was my question,
8 really, because I don't know if they did that. They
9 did revise some of the maximum magnitudes.

10 MEMBER STETKAR: Yes.

11 MR. LITEHISER: And some of the activity
12 rates.

13 MEMBER STETKAR: Well, and they had to add
14 this stuff in, in the Gulf.

15 MR. LITEHISER: They did, but I don't know
16 if they --

17 MEMBER STETKAR: They revised some of the
18 --

19 MR. LITEHISER: They re-plot the curves.

20 MEMBER STETKAR: Well, all I know is what
21 I read from the FSAR, and they're plotted as these are
22 the six.

23 MR. HINZE: There were two earthquakes
24 above 6 in 2006, and these were the only things that

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1 really entered --

2 MEMBER STETKAR: But they affected the
3 M-max in some of these sources.

4 MR. LITEHISER: Well, yes, and there's a
5 question about that right here.

6 MEMBER STETKAR: It is my understanding
7 that these were the updated, the problem is for the
8 record, this figure, the easiest one to look at is the
9 10 Hertz spectral acceleration which is Figure
10 2.5S.2-14 in the --

11 MALE PARTICIPANT: Can you say that slower
12 please?

13 MEMBER STETKAR: 2.5S.2-14. And that is
14 the 10 Hertz spectral acceleration mean -- well, let
15 me just call it each of the expert team's curves.

16 MR. LITEHISER: With the updated sources.

17 MEMBER STETKAR: I'm assuming that it's
18 the updated sources. I didn't have any reason to
19 believe otherwise.

20 MR. LITEHISER: Okay.

21 MEMBER STETKAR: Regardless of whether
22 it's the updated sources or not.

23 MR. LITEHISER: Right.

24 MEMBER STETKAR: Regardless of that. If

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1 I then look at any of the, either the peak ground
2 acceleration hazard curve or any of the spectral
3 acceleration hazard curves that are taken from these
4 experts and accounting for their uncertainty, you know,
5 according to the SSHAC process, I observe that the
6 uncertainties in those hazard curves are, as I said,
7 relatively modest when I think of error factors, a range
8 of anywhere from, it depends on the frequency, but 3
9 to 5 or so from the median to the 95th and median down
10 to the 5th, which is rather modest uncertainty.

11 But more importantly they don't increase,
12 those uncertainties do not increase substantially as
13 I go from 0.01 Hertz. It's a log rhythmic plot so it's
14 just 0.01, 0.1 and 1 is the upper bound. The
15 uncertainties don't increase as I span that factor of
16 100 range in acceleration.

17 And that's contrary to what the individual
18 expert curves show. The individual expert curves do
19 show an increasing divergence as you go to higher
20 accelerations, which means the experts disagree more,
21 if you will, which ought to affect the uncertainty.

22 And just our earthquake data at very high
23 ground accelerations is rather sparse. So there ought
24 to be more epistemic uncertainty in the modeling

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1 process as we get to higher ground acceleration, and
2 I'm not seeing this.

3 The reason I asked this, is I asked this
4 for --

5 MEMBER RICCARDELLA: You were talking
6 Hertz. When you talked about the scale you said 0.01
7 Hertz. I think you meant --

8 MEMBER STETKAR: Oh yes, 0.01G, I'm sorry.

9 MR. HEAD: I keep thinking you're talking
10 on increasing frequency on --

11 MEMBER STETKAR: Increasing
12 acceleration. Now if I look, in the FSAR there are
13 separate plots of the hazard for peak ground
14 acceleration, 25 Hertz, 10 Hertz, 5 Hertz, 2-1/2 Hertz,
15 1 Hertz, and a half Hertz. And the last two, the 1 Hertz
16 and the half Hertz, it's really difficult to tell how
17 those curves are moving because there are only
18 snapshots of them over about the 0.01G to about 0.1G.

19 So I really can't see how they're behaving
20 at high accelerations, but the PGA and the other
21 spectral accelerations do extend out to 3-5 to 1G.

22 And if you plot out the uncertainties, if
23 you calculate the uncertainties either looking at a
24 mean versus, either the percentiles or a ratio of the

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1 percentiles or however you want to characterize those
2 uncertainties, they basically, not only don't they
3 increase, in a couple of cases they seem to be
4 decreasing, slightly. You know, I don't want to get
5 to two or three significant figures. I'd be happy to
6 see an increase in one significant figure.

7 And that's just very curious behavior,
8 especially considering the fact that the individual
9 expert teams' estimates are behaving as I would expect
10 them to behave. Diverging as you get to higher
11 accelerations.

12 So I don't know what has happened in the
13 process, in the computational process that takes the
14 expert teams' estimates and produces the seismic hazard
15 curves that has homogenized the uncertainty, if I can
16 call it that. And as I said, the only reason I bring
17 this up is that the mean curve, the dotted curve, the
18 use for a GMRS ought to be derived from the uncertainty
19 analysis. It's not something that's unique of itself,
20 but to do the uncertainty analysis, and the uncertainty
21 determines the mean.

22 So I'd like an explanation of why that's
23 behaving that way. Just parenthetically, and I can't
24 tell you the applicant, I raised this with another

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1 applicant and they found an error in their
2 computational process. They didn't tell me exactly
3 what it was.

4 They came back with curves that indeed,
5 they said, yes, we found an error in it, they diverged.
6 They claimed it didn't affect the mean very much, and
7 it didn't affect the mean very much but it had some
8 effect.

9 MR. HEAD: So Joe, are we prepared to
10 discuss this anymore, or we just going to take this as
11 a follow-up action?

12 MEMBER STETKAR: I can show you more off
13 line.

14 CHAIRMAN CORRADINI: Since I'm trying to
15 understand your question and I'm hardly there yet, what
16 I'm trying to understand just to encapsulate it, are
17 you saying that their calculation, and I'm trying to
18 get clear, the approximated, the squares are taking
19 soil down to -- you had a lot of time, so I get a little
20 bit. The squares are taking down soil to Houston, I
21 didn't understand what you did there.

22 MR. HEAD: What we did is, the GMRS is what
23 we came up with to --

24 CHAIRMAN CORRADINI: The solid blue line.

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1 MR. HEAD: No, the dotted line.
2 Basically that's the results of what Mr. Stetkar was
3 talking about and that's in our COLA. And then --

4 MEMBER STETKAR: That's been around for a
5 while.

6 MR. HEAD: That's been around for a while.

7 MEMBER STETKAR: And that's why I prefaced
8 by saying I don't remember if I sat in on the last
9 subcommittee meeting that we had on this.

10 MR. HEAD: Clearly you've encountered
11 some interesting information and we understand that.
12 When the CEUS information came out later we wanted to
13 assess the impact of that on our blue GMRS curve, and
14 we felt like the thing to do was to use, first, if it
15 was appropriate, the Houston site.

16 It's only 80 miles away. It's closer than
17 New Madrid. And we confirmed that the local earthquake
18 environment is the same basically for Houston and STP.

19 MALE PARTICIPANT: CEUS didn't have
20 something for Bay City, right?

21 MR. HEAD: No, no. Houston was just
22 sitting there begging, okay, to be used, we thought.
23 And so we said, well, let's look at it. But what that
24 meant is because of the amplification that the soil

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1 provides, we took the STP soil, put it at the --

2 (Crosstalk)

3 MR. HEAD: -- creating with the soil of the
4 Bay City site. With the information of the CEUS we
5 created the four red squares, and that's not different
6 than what you originally had, which is close enough to
7 what we --

8 CHAIRMAN CORRADINI: So my question is,
9 what John's asking was it in the formation of the dash
10 line or the red squares?

11 MR. HEAD: Dash line.

12 CHAIRMAN CORRADINI: And the solid blue
13 line is simply a multiplicative of the dash line?

14 MR. HEAD: No, it's our SSE that we're
15 using for design purposes that is above --

16 CHAIRMAN CORRADINI: Okay. So the
17 essence of John's question is, is the dash line
18 correctly calculated? Is that what you're asking?

19 MEMBER STETKAR: Okay. Now if you'll let
20 me talk. The essence is, is the dash line correctly
21 calculated, and if it's incorrectly calculated does it
22 actually exceed the solid blue line someplace.

23 CHAIRMAN CORRADINI: That part I get.

24 MEMBER STETKAR: Solid blue line is a

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1 contrived line, if you will. Now as a follow-on, and
2 I'm going to ask the staff about this because I
3 understand absolutely what you did. The red dots in
4 here are derived from the --

5 FEMALE PARTICIPANT: It's 9 o'clock.

6 MEMBER STETKAR: Thank you. The red dots
7 are actually derived from the Houston test site or
8 whatever you want to call it in NUREG 2115. I've
9 absolutely the same comment about the hazard curves in
10 NUREG 2115. Those uncertainties don't increase. So
11 there's something fundamental about the way people are
12 doing these things.

13 CHAIRMAN CORRADINI: But you don't
14 understand.

15 MEMBER STETKAR: But I do not understand
16 what seems contrary to what I can look at as the input
17 data.

18 CHAIRMAN CORRADINI: Okay, noted.

19 MEMBER STETKAR: So I was asking him about
20 the dash curve. I was going to ask the staff, because
21 the staff owns the NUREG, about the dots, because you
22 didn't do the dots. I mean you did the dots with the
23 soil amplification, but you took the --

24 MR. HEAD: But if your question is

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1 resolved adequately, then the dotted blue lines and the
2 red dots all have a basis. If there's an issue, well,
3 then obviously we need more --

4 MEMBER STETKAR: If there's an issue it
5 seems to be an issue both in the way you did the
6 calculation for the dashed blue line and in the way that
7 NUREG 2115 does the calculation for their hazard curves
8 for the Houston site.

9 MR. HEAD: So if you don't mind, since we
10 weren't prepared to discuss this in detail, this other
11 insight from this other applicant, was that related to
12 the uncertainties --

13 MEMBER STETKAR: Yes.

14 MR. HEAD: So they found, and so --

15 MEMBER STETKAR: I asked exactly the same
16 question. I made the same observation, and they said
17 we'll take it back because we don't have the people here
18 and it's pretty detailed. And it came back and they
19 said, yes, we found an error in the way we were
20 calculating on our uncertainties.

21 MR. HEAD: And then the way they did it,
22 did they also say the CEUS or did they explore that?

23 MEMBER STETKAR: They didn't do the
24 derivation. They took the CEUS data and redid their

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1 dashed --

2 MR. HEAD: They redid it, okay.

3 MEMBER STETKAR: So they didn't use the
4 Houston, you know, they didn't have a site close to them
5 basically.

6 MR. HEAD: Okay. Bill?

7 MR. HINZE: Well, if this is really a
8 related question, the characteristics that your expert
9 team came up with for the Gulf Coast seismic zones are
10 very important because your site is really within that.

11 And when I looked at the TI team's spread
12 of seismic hazards in that zone, this was modified to
13 a final which was not the TI team's decision, but the
14 final is less than the TI team's magnitudes.

15 And in Table 2.52-3 of the SER, you can see
16 that the final M-max in some cases are less than what
17 the TI team came up with, and they had the information
18 of the two earthquakes in 2006 and much more relevant
19 up-to-date information. And I'm just wondering,
20 there's no explanation of why those values were
21 decreased when in the final M-max in your consideration
22 of the EPRI SOG.

23 MR. HEAD: I will give a first attempt to
24 this and then, Joe, if you want to add. But clearly,

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1 the SSHAC process is a --

2 MR. HINZE: Let me show you this. This is
3 the final M-max and this is for the Gulf Coast hazard
4 zone, and these are what the TI team came up with. And
5 I don't understand why these were changed or
6 justification for the change. For some of the teams
7 it was not decreased but for others it was decreased.
8 And the maximum magnitudes are extremely important in
9 that PSHA.

10 MR. LITEHISER: Scroll up.

11 MALE PARTICIPANT: What do you want? Do
12 you want to scroll up?

13 MR. LITEHISER: Yes.

14 MR. HINZE: I'm a mouse man and I'd screw
15 that up.

16 MEMBER STETKAR: While they're doing that
17 I went back and looked and I confirmed that indeed the
18 two curves that I referred to with the individual
19 seismic expert teams shows that, the FSAR says that
20 those do account for the updated information from the
21 Gulf of Mexico. So they aren't just simply copied from
22 the old SOG, they are the updated ones.

23 MR. HINZE: For example, well, let's take
24 the Bechtel zone, okay, and there's a 7.2 in the TIP

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1 from the STP project, but that's lowered to 6.6 and
2 without any explanation I think that's risky business.
3 And there must be an explanation.

4 MR. LITEHISER: I'm sorry, I don't know
5 what it is offhand.

6 CHAIRMAN CORRADINI: Okay, so we have a
7 second thing that you have to go weigh in.

8 MR. HEAD: Well, I believe we did answer
9 that question in an RAI response and in interactions
10 with the staff regarding the original TI conclusions
11 versus where we ended up. We had extensive debate,
12 well, not debate, but discussion on the SSHAC process
13 and how the team came up with that conclusion.

14 And then given that there was, you know,
15 two different potential outcomes based on those
16 discussions, we did a sensitivity study to show that
17 it really had no real impact on the overall GRMS curve.
18 And that's discussed in the original SER.

19 CHAIRMAN CORRADINI: These are the RAIs
20 dated May 2nd?

21 MR. HEAD: Of last year?

22 CHAIRMAN CORRADINI: Yes.

23 MR. HEAD: No, sir. This issue, I
24 believe, what you're describing, this issue was

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1 discussed some three or four years ago.

2 CHAIRMAN CORRADINI: But nobody in the
3 room seems to remember how it was resolved.

4 MR. HEAD: Although there was a
5 sensitivity study that if you kept the TI numbers as
6 they were, okay -- am I headed in the right direction?

7 CHAIRMAN CORRADINI: Yes.

8 MR. HEAD: If you kept the TI numbers as
9 they were as opposed to the consensus that came out of
10 these SSHAC probabilistic process, and if you kept the
11 TI numbers as they were and redid the curves, the curves
12 were only like three percent different at the max.

13 MR. HINZE: Yes, you know, I can
14 understand that, Scott, but it really is disturbing to
15 see the values decreased and without any justification.
16 I mean, it would just take a sentence or two to include
17 a why that was done.

18 CHAIRMAN CORRADINI: John just noted that
19 he --

20 MEMBER STETKAR: I recall reading that in
21 the SER anyway.

22 MR. HEAD: Well, the 2.5 SER has that
23 discussion in it.

24 MEMBER STETKAR: Yes. I'm searching for

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1 the section, but the staff should be able to --

2 CHAIRMAN CORRADINI: Why don't we leave it
3 to the staff to answer that if it's in the SER? Keep
4 on going.

5 MR. HINZE: I would like to make another
6 comment, and that is that if you go to Section 8 of 2115,
7 and on Page 8-1 there's a statement made. And believe
8 me, that document was reviewed very heavily and I took
9 part in that review.

10 And one of the statements that is made in
11 the first paragraph of that Page 8-1 is the following,
12 referring to the calculations at the test site. "All
13 of these calculations were made for demonstration
14 purposes and should not be used for design or analysis
15 for any engineered facility."

16 So I wonder if anyone was concerned about
17 that or the fact that there was a strong statement made
18 in 2115.

19 MR. HEAD: We agree totally with that,
20 okay. We would never, you know, contemplate doing
21 anything like that. But as a sensitivity study and to
22 allow us to draw some conclusions regarding our
23 original SSHAC derived curve, we thought it was
24 appropriate to use. And if the results had been

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1 drastically different, then we would have said, well,
2 that didn't work, and we would go ahead and have redone
3 the entire effort.

4 But first of all, given the results that
5 we expected because Houston is so close to the South
6 Texas and given that this was new results or new data
7 available to us, we felt that it was appropriate to,
8 at least from a confirmatory standpoint, to give us some
9 insight regarding the adequacy of the original GMRS
10 curve.

11 Since then of course we have the ground
12 motion model, which you don't see the results of that
13 on here, but that's even made a bigger impact. And
14 you'll see some of that with respect to the curve that
15 the staff generated as part of their own sensitivity,
16 or their own calculation.

17 So we would never use that information from
18 the test site as part of design or, you know, really,
19 analysis. It was really used as a confirmatory
20 assessment of where we are with respect to this new
21 information.

22 MR. HINZE: It's where you started though.
23 It's where you started with the PSHA, right?

24 MR. HEAD: Right.

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1 MR. HINZE: You mean the hard rock.

2 MR. HEAD: Yes, sir.

3 MR. HINZE: Right. So let me ask you,
4 there are two reasons given why you can justify the
5 Houston test site calculations. One is similar
6 geology and tectonics, and that certainly is true, and
7 similar activity rates. Well, what were those
8 activity rates and what kind of quantitative assessment
9 was made on those?

10 MR. HEAD: Okay, well, there's quite a bit
11 of discussion that we had with staff, and I'm going to
12 ask Joe to go ahead and --

13 MR. LITEHISER: See if I can answer one
14 question here. We looked at the activity rates from
15 the original EPRI SOG, which are published from our own
16 updated EPRI SOG which we calculated, from the CEUS and
17 a study, this 2115 we've been talking about, and the
18 USGS 2008 characterizations, all of which are available
19 in one form or another.

20 And actually looked at the one degree by
21 one degree, or half a degree by half a degree grid values
22 for all of those four cases and then normalized them
23 all to Houston's site just to give us an idea of how
24 many -- we looked specifically at the number of

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1 magnitude 5 and above earthquakes because those are the
2 ones that get into the hazard analysis.

3 So that was the basis for our statement that the
4 activity rates are similar and slowly varying over this
5 --

6 MR. HINZE: So it was actually a
7 quantitative analysis --

8 MR. LITEHISER: Absolutely, yes.

9 MR. HINZE: Thank you.

10 MR. HEAD: I believe the staff asked this
11 RAI to do that assessment.

12 MR. LITEHISER: That was part of the
13 response to 105-1 RAI, yes.

14 CHAIRMAN CORRADINI: I think we found it,
15 to help Bill out. Bill, the discussion is in the SER,
16 Pages 65 and 66, about, I think, your first question.
17 So we'll come back with the staff just to --

18 MEMBER STETKAR: Yes, there's quite a long
19 discussion of several pages that goes through each of
20 the groups and what the range of M-max that they used
21 for each of the groups. There's a discussion of what
22 the TI team did about that.

23 There's a discussion about a review, you
24 know, peer review that came back and questioned that

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1 process that's laid out extensively in the SER. Not
2 so much in the FSAR, but I'm assuming that was in
3 response to RAIs or something.

4 CHAIRMAN CORRADINI: Okay, Bill, did you
5 have another question?

6 MR. HINZE: No, that's good.

7 CHAIRMAN CORRADINI: Scott?

8 MR. HEAD: So any other questions about
9 this point? Because assuming that we come back and
10 validate our GMRS curve is appropriate, then that what
11 you've seen is the basis for us to say that we've
12 assessed the CEUS results and we believe that curve is
13 still appropriate, and our SSE for the site including
14 our SSE for design, the DCD structures, is still
15 adequate. Okay?

16 So I have additionally, I guess it would
17 be one and a half follow-on items. I have certainly
18 the one follow-up item regarding the uncertainties that
19 I believe we understand in terms of the way the curves
20 look, and certainly we have the transcript, or would
21 you like a repeat of that at this --

22 MR. LITEHISER: No, let's talk a little
23 bit off line on this.

24 MR. HEAD: Okay. And again, this TI

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1 discussion that we had, you know, obviously the staff
2 can discuss it some more detail, but SER does, I think,
3 represents --

4 MALE PARTICIPANT: Okay.

5 MR. HEAD: I think I remember same line of
6 questioning, you know, a couple years ago and that was
7 the result. So then I'm going to go ahead and move on
8 to -- for the ACRS, I'll just remind everyone that
9 Appendix 1E is where we put all of our information
10 regarding Fukushima that was either new or described
11 where the information existed elsewhere in the COLA to
12 address the recommendations that were pertinent to STP
13 3 & 4.

14 What I'm going to talk about today is 7.1,
15 Spent Fuel Pool Instrumentation. Our design includes
16 reliable level and temperature monitors. The level
17 and temperature is provided in the main control room
18 via process computer, and the level indication is also
19 available at the remote shutdown panel.

20 And that's something that you'll hear more
21 of when we have our FLEX discussions in September and
22 in our use of the remote shutdown panel. So that's
23 important that it's there also.

24 There's two permanent fixed instrument

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1 channels. They're separated to provide protection
2 from missiles. It's the indication from the top of the
3 fuel racks to the normal operating level, and they are
4 powered by 1E batteries. Next slide.

5 They're consistent with the NEI guidance
6 and they're consistent with, you know, the orders. And
7 all of this ultimately will be demonstrated as part of
8 an ITAAC that we've included in our COLA. Let me stop
9 there for any questions.

10 MEMBER STETKAR: Yes.

11 MR. HEAD: Yes, sir.

12 MEMBER STETKAR: This is the level
13 indication that you're planning to install a continuous
14 readout over the full range from the top of the fuel
15 what to whatever, something above the normal level, or
16 does it just provide alarms when you reach each of the
17 three discrete level bands that have been identified
18 in there?

19 In other words, if I'm an operator, can I
20 actually see that level is X.XX? And even what I'd
21 rather do if I'm an operator is put it on a strip chart
22 recorder or a trend and see how it's going and how fast
23 it's going. Can I do that as an operator?

24 MR. SCHEIDE: Yes, sir. My name's Dick

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1 Scheide. I work for NINA as a licensing engineer. And
2 we'll have continuous level indication from the top of
3 the fuel racks to above the normal operating level.

4 MEMBER STETKAR: Good. Thank you.

5 MR. HEAD: The instrumentation as of right
6 now has not been --

7 MEMBER STETKAR: No, I understand. It's
8 just that, you know, the design philosophy, I can design
9 instrumentation any way I want to, for readouts anyway.
10 Thank you.

11 MR. HEAD: Okay. Let me ask, any other
12 questions on spent fuel instrumentation? Okay. Then
13 the last one I'm going to talk about is emergency plan
14 staffing and communication.

15 CHAIRMAN CORRADINI: Just one thing,
16 because I don't remember and so it's more for
17 clarification. So there'll be temperature indication
18 and enunciation along with the level indication, or
19 just level? That's what I didn't --

20 MEMBER STETKAR: Level and temperature
21 are what's normally there.

22 MR. HEAD: Right.

23 MEMBER STETKAR: They go away.

24 MR. SCHEIDE: In normal operation we've

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1 got level and temperature in the control room. When
2 we get into the event the process computer goes away.
3 We have level indication only at the shutdown panel.
4 Yes, sir. There's no temperature indication there.

5 CHAIRMAN CORRADINI: Okay, thank you.

6 MR. HEAD: Okay, and the last one is the
7 emergency plan staffing and communication.
8 Ultimately, the emergency plan, since STP Nuclear
9 Operating Company will be running all four sites, it
10 will be part of a site-wide plan for Units 1 and 4.

11 The NEI guidelines for assessing beyond
12 design basis accidents will be used to assessing the
13 staff and the communication abilities necessary for a
14 multi-unit design basis accident.

15 What we've committed to do is we'll perform
16 an assessment based on those guidelines, and this will
17 be after obviously 1 and 2 have been, you know, done
18 their work that will be used to develop procedures for,
19 we'll use the operational programs to develop the
20 procedures for staffing and for assessing
21 communications.

22 And all of that ultimately is included as
23 part of an ITAAC for closing out those assessment
24 results and for the resulting changes to the emergency

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1 plan that, like I say, at that point in time will be
2 an emergency plan for all four units.

3 Any questions on our plans there? Now let
4 me back up just to preview. We proposed that process
5 at the end there as an ITAAC to close out the different
6 activities. If the NRC has concluded that they would
7 prefer that process to be addressed via a license
8 condition, and so obviously, you know, we will --

9 CHAIRMAN CORRADINI: So this is a process
10 question which I should know again, but I don't.
11 Remind me of the difference because both would
12 essentially stop you from operating. So what am I
13 missing? I'm sorry.

14 MR. HEAD: Well, clearly the staff has
15 their processes for developing license conditions and
16 then we normally find them acceptable.

17 CHAIRMAN CORRADINI: I would think you
18 would.

19 MR. HEAD: Clearly, and this is, you know,
20 we've had this question over a number of different
21 review topics as to whether it's ITAAC or license
22 condition, and the staff, I think, can expand on that
23 more.

24 I guess my point is, is what's going to be

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1 is that if since that license, we'll be headed towards
2 a license condition, we'll ultimately remove the ITAAC
3 from the COLA. There's really no reason to have both,
4 you know, from up there.

5 CHAIRMAN CORRADINI: Thank you.

6 So that concludes our discussion, and I
7 guess based on what you said earlier we do have one
8 follow-up item regarding uncertainties and the various
9 curves that were used ultimately to develop our GMRS
10 curve.

11 And I'm thinking that probably our next
12 opportunity to present that to you would be in September
13 at the Fukushima, well, the Fukushima presentation
14 would be the logical place to do it. So we'll certainly
15 be prepared to address that at that point in time.

16 Other questions? Okay, thank you. So
17 the staff will now join us, and we get to ask them the
18 same questions or similar questions.

19 MS. GOVAN: Good morning. My name is
20 Tekia Govan. I'm the project manager for the review
21 of Chapter 2.5 entitled "Geology, Seismology, and
22 Geotechnical Engineering," as this chapter relates to
23 the South Texas Project for COL application.

24 Today the staff is here to present the

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1 findings of their review for Phase 4 which has resulted
2 in a safety evaluation with no open items.

3 As a little background on Chapter 2 which
4 is entitled "Site Characteristics," I wanted to remind
5 ACRS that Sections 2.1 and 2.2, 2.1 being geography and
6 tomography, 2.2, nearby industrial, transportation and
7 military facilities, was presented to the ACRS
8 subcommittee as an SER with no open items in June 2011.
9 That meeting resulted in no ACRS action items.

10 Section 2.3, meteorology, and Section 2.4,
11 hydrology, were presented to the ACRS subcommittee as
12 an SER with no open items in April 2013, which resulted
13 in one ACRS action item 106, and this action item
14 requested the NRC staff to brief the subcommittee on
15 how lessons learned relative to uncertainty in the main
16 cooling reservoir embankment break analysis will be
17 incorporated in the standard review plan. This action
18 will be discussed in further detail at a later portion
19 of this morning's agenda.

20 Section 2.5, geology, seismology and
21 geotechnical engineering, was presented as an SER with
22 open items in November 2010 which resulted in two ACRS
23 action items, number 96 and 97. The focus of today's
24 presentation is the staff's safety evaluation with no

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1 open items, and within that presentation we'll also
2 discuss action item 96 and discuss the pointer to action
3 item 97.

4 The staff review team consisted of the
5 Geosciences and Geotechnical Engineering Branch with
6 Rebecca Karas and Diane Jackson as branch chiefs;
7 Laura Bauer, geologist; Dr. Yong Li, senior
8 geophysicist; Sarah Tabatabai, geophysicist; and
9 Frankie Vega, geotechnical engineering; as well as
10 myself, Tekia Govan, and Tom Tai, as project managers.

11 Just to give a quick summary of the staff's
12 review, there are no open items associated with
13 Sections 2.5.1, 2.5.2, 2.5.3. and 2.5.5. During our
14 last ACRS meeting for Section 2.5 we resolved SER open
15 items relating to settlement, shear wave velocity, and
16 backfill.

17 So today's presentation will focus on a new
18 license condition that has been added to Section 2.5.1
19 regarding geological mapping, and ACRS action item 96
20 with respect to concerns for growth fault at the STP
21 site, as well as the closure of SER open item 2.5.4-31
22 regarding backfill ITAACs in confirming engineering
23 properties.

24 At the last ACRS meeting in November 2011,

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1 we had an action item number 97 that requested the staff
2 to answer the question, will it be necessary to
3 determine the impact of new seismic source
4 characterization modeling and the result of the -- I'm
5 sorry. Let me go back.

6 During that meeting we were asked to answer
7 the question, will it be necessary to determine the
8 impact of new seismic source characterization model and
9 the results obtained using the EPRI SOG model? The
10 response to this question and the evaluation of the
11 information is contained in Chapter 22 of our safety
12 evaluation for Fukushima 2.1.

13 So we will be addressing and hopefully
14 closing out that item in the staff's presentation for
15 Fukushima 2.1 which will be handled after this
16 morning's break. And with that I will turn it over to
17 Dr. Yong Li who will provide us the staff's review on
18 Section 2.5.1.

19 MR. LI: Okay, in this section I'm going
20 to focus on two items. One is the licensing condition,
21 2.5.1-1 and another one is a concern from the ACRS on
22 the growth fault at the STP site. Next, please.

23 Yes, licensing ought to be mentioned that
24 the licensing condition, basically we required the

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1 licensee perform the geological mapping during the
2 excavation period for the safety related structure.

3 So this is basically already laid out in
4 the RG 1.132 and the 1.208. That's the guidance
5 already provided in those two regulatory guides
6 adjusting to perform those mappings, because the
7 detailed mapping of the excavation surfaces ensures no
8 features indicative of capable tectonics. Capable
9 means it can produce earthquake and can potentially
10 cause displacement of subsurface. For those features,
11 you know, make sure it's not existing underneath the
12 safety related structure. Next, please.

13 So that's the licensing condition
14 including the SE. I'm not going to read it.

15 Yes, Bill?

16 MR. HINZE: Excuse me, but is that
17 underneath the nuclear island or is that broader than
18 that?

19 MR. LI: It's broader. The nuclear
20 island mainly focusing on the, actually come from the
21 AP1000. It's a huge island including all the safety
22 related structure. But for this one it's a different
23 design. So the depths of safety related structure at
24 different depths. So it's not the uniform basemat.

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1 So multiple depths for safety related structure.

2 Like the reactor building existing at the
3 90 feet that's, but other building could be less, so
4 it's not the whole piece.

5 CHAIRMAN CORRADINI: Did that answer your
6 question? I'm not sure.

7 MR. HINZE: Yes. I think what we're
8 hearing is that it's larger than the nuclear island.

9 CHAIRMAN CORRADINI: That's what I
10 thought I heard.

11 MR. HINZE: And I wonder how much the
12 excavations are going to tell us outside of the nuclear
13 island.

14 MR. LI: It's not necessarily bigger than
15 the nuclear island.

16 CHAIRMAN CORRADINI: If I might just
17 interrupt just to make sure. So what we saw in the
18 cartoon from NINA were one-to-one mapping of what
19 you're saying. The brown area is the excavation
20 they're going to be looking at, and that's what you are
21 in agreement with. We're not talking greater than
22 that, that is the area you're speaking about?

23 MR. LI: Yes.

24 CHAIRMAN CORRADINI: Okay. I just wanted

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1 to make sure we're on the same page. Okay.

2 MR. LI: Okay, next please. This is the
3 concern from ACRS regarding the growth fault at the STP
4 site. Basically the item, I'll read it here.
5 Basically it's in case the, would high-resolution
6 shallow zone seismic reflection profiling using
7 appropriate apertures, detail and the best available
8 techniques provide useful information on the presence
9 and nature of the growth faults at the STP 3 & 4
10 construction zone and in the vicinity of the main
11 cooling reservoir where the GMO and the GMP faults were
12 found?

13 So that's the concern. So in order to
14 address this concern --

15 MR. HINZE: Can I interrupt you for --

16 MR. LI: Absolutely.

17 MR. HINZE: The location of a GMO and GMP,
18 those were largely taken from drilling results used by
19 geomap and extrapolation of structure contour maps?

20 MR. LI: Okay, yes. Okay, there were
21 multiple generation of the growth faults in that
22 station at the site. During the Units 1 & 2
23 investigation, they already identified those faults
24 but it's called a different name. It's called an STP

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1 1-2 to whatever, there's a name there, yes. I will show
2 those in the maps later on.

3 But then there are multiple geologists in
4 those periods from 1980s to now. They did a different
5 investigation, like a GMO was named by another
6 geomapping group. Does that answer your question?

7 MR. HINZE: No, it doesn't. How are GMO
8 and GMP positioned at the surface? What evidence is
9 used to position those on the surface?

10 MR. LI: Yes, if it was the fueling units
11 1-2, they apply to the shallow seismic reflection
12 profile. They project those to the surface. That's
13 where the STP 1-2 comes from. But the STP 1-2 overlap
14 was a GMO.

15 GMO goes down through a mapping by a
16 geomapping group. They took the topographic
17 measurements and also combined with the existing data
18 including the interpretation of the reflection lines.

19 MR. HINZE: Those reflections lines on 1,
20 and for 1 and 2, did they show the position of GMP and
21 GMO?

22 MR. LI: They showed that, yes. They
23 don't have a linear expression but they have scattered
24 points, like STP 1-2, it's overlap with GMO. Basically

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1 it's one point on the GMO. I'll show that in the next
2 slide. I'll show you that, yes.

3 So let's start with the growth fault
4 definition. The growth fault is a type of normal
5 fault. There are many, many different faults. There
6 is reverse fault, normal fault, strike-slip fault, but
7 this is type of normal fault. So basically, the --

8 CHAIRMAN CORRADINI: I know this is
9 animated, so I'm getting excited.

10 MR. LI: It's not animated, sorry. But
11 we'll have one later on. But this is a fault line.
12 Basically this is a fault line. You see that the
13 hanging wall slides down, okay, and that's a normal
14 fault. But this is a special type of normal fault
15 because this form during the deposition process.
16 Normally the hanging wall have thicker sediments than
17 the footwall. So it's a moving and deposition, moving
18 and deposition, that kind of process. That's special
19 characteristic of growth fault. So next, please.

20 So it's gravity-driven geological
21 features there and resulting from the abundant
22 sedimentary deposition. And on the Gulf coastline
23 from Louisiana to Texas, you would probably see a lot
24 of the growth faults there. Yes. And usually it's

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1 non-seismic, even the seismic event could be very, very
2 smaller. And it also has a poor continuation. And if
3 it's active, they move very slowly.

4 MR. HINZE: Continuation, you mean in
5 space or time?

6 MR. LI: Space, spacing.

7 MR. HINZE: Space.

8 MR. LI: Yes. You will see that. You see
9 it's somewhat relying on not very continuous, like we
10 see like San Andreas fault, just a comparison. Yes.

11 MR. HINZE: What about in time?

12 MR. LI: In time it could be, well, in
13 time, generally speaking, when you have abundant
14 sediment, patient sedimentary process there, it could
15 be very active. But when you're far away from the
16 sedimentation center the process slow down, eventually
17 extinguished.

18 MR. HINZE: I wasn't thinking of the rate,
19 I was thinking of whether it is continuous or episodic
20 or intermittent. The information that I have suggests
21 that the growth faults can be intermittent.

22 (Crosstalk)

23 MR. HINZE: That could reach a point where
24 that district fault overcomes the friction on the salt

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1 or the shale of that, that it's moving on. And so it
2 can be intermittent, right?

3 MR. LI: Yes, but remember it's gravity
4 driven, so you have a lot of sedimentation process
5 involved in order to make it slide, otherwise it's, yes,
6 it's not so active. Next, please.

7 MR. HINZE: Thank you.

8 MR. LI: So many methods can be used to
9 detect a growth fault. For example, shallow seismic
10 reflection, it's addressing the concern. It's just
11 using the high tech of, I mean later technology using
12 the shallow seismic reflection.

13 And also you can use boring logs. Through
14 many holes can detect the growth fault too by
15 continuation of the stratigraphic layers. And also
16 using LIDAR and the leveling, which is basically a
17 matter of the detailed terrain change on the surface.

18 And also, I mean this is just a short list.
19 There are other methods can do that too. And also the
20 combination of all those. Next, please.

21 So the licensee applicant, basically, they
22 as I mentioned before, this is multi-phase study since
23 1980s. This growth faults always there for the STP
24 site. So they did extensive studying, the Units 1 and

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1 2 study for the detecting the growth fault.

2 And the applicant combined all the
3 previous study including the '80s Unit 1-2 study, and
4 also forming up other geologists' investigation at the
5 site. So they used boreholes, aerial and the field
6 reconnaissance, geodetic survey to characterize those
7 faults.

8 But as this concern expressed, they didn't
9 apply new shallow seismic reflection lines. However
10 --

11 MR. HINZE: Even reflection.
12 Reflection.

13 MR. LI: Shallow reflection, yes, lines.
14 So even the latest, the shallow seismic reflection
15 lines still provides relatively resolution at the near,
16 very near surface. So it's not the perfect solution,
17 let's put it that way.

18 MR. HINZE: You're not really interested
19 in mapping the individual units of that Beaumont
20 Formation, but you're interested in looking at, and
21 this is but what one would see in the use of reflection
22 to map the faults is you would see a disruption.

23 And as we know these growth faults are not
24 a simple line as we so commonly depict them, but they're

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1 really very complex zones. And as a result, the
2 reflections in those areas are scattered and so you get
3 a breakup in the reflections at these fault zones. You
4 don't have to worry about resolution of the individual
5 lines, but it's rather the breakup. I'm not
6 a reflection seismologist. I've published on this,
7 but I've talked to Don Steeples who I think you'll agree
8 is probably the top man in this area, and I chatted with
9 him yesterday about this, in fact.

10 And he's in full agreement that one could
11 use seismic reflection for this kind of thing. But I
12 agree with you very much that the resolution of the
13 individual units in the Beaumont would not be the clue.
14 It would be the breakup in the reflections.

15 MR. LI: Yes.

16 MR. HINZE: But your first bullet,
17 sub-bullet there is right, but it doesn't get at the
18 point of really mapping with the seismic reflection.

19 MR. LI: Yes, but even if they didn't use
20 the latest of technology regarding the shallow seismic
21 reflection lines, they still detected the growth fault
22 at the site. That's the fact there.

23 MR. HINZE: In the 1985 reflection work,
24 you're saying that they mapped these growth faults

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1 right up to the surface?

2 MR. LI: Projected to the surface.

3 MR. HINZE: Projected is different than
4 mapped. I'm talking about -- projection is something
5 else. But did the 1985 reflection work, I assume
6 you've seen it, can you discern, identify the faults
7 on those, on the shallow seismic reflections? Not the
8 petroleum reflection, but the shallow seismic.

9 MR. LI: I didn't have a chance to look at
10 those profiles, I should say.

11 MR. HINZE: Well, who did the work?
12 Weston? Weston Geophysics (sic)? I suspect so.

13 CHAIRMAN CORRADINI: I guess that you guys
14 are conversing about this, but I'm not following the
15 importance of it. You're interested, can you just kind
16 of give me a --

17 MR. HINZE: Okay, what we're trying to do
18 is determine, ascertain whether a seismic reflection
19 can map the growth faults to near the surface, to the
20 surface. And that's what this is about, and that's
21 what my line of questioning was.

22 But it appears that despite the fact that
23 one can map with the reflection method, these growth
24 faults, that it's sufficient to have the mapping of

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1 these in the excavated zone and that is sufficient for
2 the purposes of the safety of the site. That's the
3 bottom line.

4 So what that means is that it would be
5 helpful to have the seismic reflection, but it is
6 unnecessary.

7 MR. LI: They already detected the surface
8 expression of the growth fault at near the MCR, main
9 cooling reservoir, even they did not use the latest
10 shallow seismic reflection line. That's the second
11 bullet telling us. Yes.

12 So I'll show you next slide which tells you
13 through the geodetic survey they found that this, I mean
14 relatively topographic change which indicates this
15 growth fault already to there.

16 CHAIRMAN CORRADINI: What I guess I'm
17 trying to ask between the two of you is you seem
18 satisfied. I'm trying to understand your
19 satisfaction.

20 MR. HINZE: My satisfaction is that the
21 RAI that has been proposed is satisfactory for the
22 safety purposes of this site. That's the bottom line.
23 I mean putting it into the context of the nuclear power
24 plant, that's where we're at.

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1 CHAIRMAN CORRADINI: Okay.

2 MR. LITEHISER: And just to clarify, you
3 meant the licensing condition as opposed to RAI?

4 MR. HINZE: Yes, licensing --

5 MR. LI: Licensing condition is another
6 defense line to ensure there's no surprise. Yes.

7 CHAIRMAN CORRADINI: So let me ask you a
8 technical question. I've been trying to follow this
9 and I'm struggling. The way you describe it is, one,
10 you have to map it, two, the license condition would
11 look at the evolution of it as time marches on, because
12 you've asked when the time that actually this comes in
13 operation you'll, from a license condition, refresh
14 what you know about the growth fault.

15 But what I'm trying to understand is, is
16 it because it's a source of seismic activity or because
17 it affects the analysis of a major seismic activity that
18 would be somewhere else? That's what I'm confused
19 about.

20 MR. HINZE: These growth faults, as has
21 been pointed out very well, are so slow moving that
22 they're considered aseismic. They do not produce
23 vibratory motion.

24 CHAIRMAN CORRADINI: They're just there

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1 as obstructions or -- yes.

2 MR. HINZE: They're deformed. About an
3 inch a year or something like that is very common as
4 type of movement. And the deformation of course can
5 be disastrous through a structure that's on top of it.
6 And one sees this all over the Gulf Coast region.

7 CHAIRMAN CORRADINI: Right. But that's
8 the purpose in mapping. That seismicity is --

9 MR. HINZE: Seismicity is not a problem.

10 MEMBER RICCARDELLA: The concern is it
11 might have an effect on this main cooling reservoir if
12 there was a significant --

13 MR. LI: Main cooling reservoir and the
14 safety related structure of course.

15 CHAIRMAN CORRADINI: So I'm going to ask
16 a question that maybe is out of bounds, but it's just
17 something that comes to my mind. So is oil and gas
18 drilling in the area prevalent that that actually is
19 the source of any of this, or is this, it's unrelated?

20 MR. LI: It's generally unrelated.

21 CHAIRMAN CORRADINI: Okay. Why?

22 FEMALE PARTICIPANT: Sedimentation over
23 time.

24 CHAIRMAN CORRADINI: Because of just the

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1 geology is such that --

2 MR. LI: Yes.

3 CHAIRMAN CORRADINI: -- they could inject
4 all sorts of junk and suck out all sorts of stuff and
5 it's no issue?

6 MR. LI: This area has a lot of
7 sedimentation in a process going on, so heavy sediments
8 is causing this kind of process.

9 CHAIRMAN CORRADINI: And that's the
10 dominant process?

11 MR. LI: Yes.

12 CHAIRMAN CORRADINI: Okay, thank you.

13 MR. LI: Next, please. Yes, as we can see
14 from this slide, FSAR already concluded on the growth
15 faults. Basically they indicates the GMO faults
16 already expressed at the surface from their survey,
17 which is inside the five kilometers radius of the STP
18 3 & 4 but outside the one kilometer radius.

19 The deformation is characterized by
20 south-down monoclinial flexure of land surface and is
21 distributed across horizontal distance over 180 to 500
22 feet. It should be noted that the Beaumont Formation
23 is about 0.1 to one million years old. Next, please.

24 But this is a mapping which indicates the

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1 existence of the growth fault in the area. In the
2 middle of the 25-mile radius is the STP 3 & 4, and the
3 reservoir was marked with blue there, the kind of not
4 exactly rectangular shape, yes, right south of the STP
5 3 & 4. That's the general outline of the growth fault.
6 You see the -- next, please.

7 Okay, sorry. This map is not so clear.
8 But you see the main feature in the middle of this five
9 miles radius is the main cooling reservoir. On this
10 side, this is a GMO fault, growth fault, and this is
11 a GMP fault. That's the one we have concern with.

12 And please notice there are multiple
13 measurements here, STP 1, 2, 3 and the 4. I'll show
14 you the profile across those measurements there.

15 MR. HINZE: The blue lines are the seismic
16 lines that were conducted for STP 1 & 2?

17 MR. LI: Blue lines, it's profile. They
18 did the profile. Yes, it's --

19 MR. HINZE: They're seismic reflection
20 profiles, right?

21 MR. LI: I think so, yes. And those dots,
22 the blue dots on those line are where they expect that
23 the growth fault project to the surface. That's why
24 you can see this point, STP 1-2L is overlap with GMO,

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1 yes. So that's the growth faults here. Next, please.

2 There's a surface deformation affected at
3 several points on those profiles. One is STP L1, L2,
4 L3 and L4. Actually, only the L1, L2, L3 currently
5 indicate the growth fault already to the surface, but
6 not STP L4 which closer to the main cooling reservoir.

7 So a little farther away from the main
8 cooling reservoir, you see clear deformation of
9 surface, but when you get closer to the main cooling
10 reservoir, the STP L4, and on the same growth fault
11 projection, you don't see that clearly. Next, please.

12 MR. HINZE: Could you go back two slides?
13 You mentioned that the blue dots are what?

14 MR. LI: During the STP Units 1 & 2
15 investigation, they project those growth fault at those
16 dots. You can see STP 1-2L, STP 1-2A, B, C, D,
17 multiple. That's why, it's a multi-phases
18 investigation at the sites.

19 MR. HINZE: I just don't see the growth
20 faults in going through all of those blue dots. I guess
21 that is the concern.

22 MR. LI: Well, you can see, like if we, the
23 STP 1-2A goes this way. Normally they go through the
24 east to westward. The same as STP L, STP 1-2L.

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1 MR. HINZE: How about the one directly
2 north of that?

3 MR. LI: Yes, it goes this way.

4 MR. HINZE: How about the one directly
5 north of that?

6 MALE PARTICIPANT: The three dots up
7 there.

8 MR. HINZE: Three dots. Do those --

9 MR. LI: Where, three dots? Those three
10 dots?

11 MR. HINZE: Are those growth faults?

12 MR. LI: Yes, those are the projected
13 growth faults at the surface.

14 MR. HINZE: I don't see those on your map.
15 But, no, I don't see them on this map.

16 MR. LI: Yes, this is a small scale, so
17 this is a blow-up of that one, the next one.

18 MR. HINZE: Go ahead.

19 MR. LI: So for the biggest concern is for
20 the safety related SSCs, structure system and
21 components. So we have multiple defense line
22 indicates, you know, there's no concern for growth
23 fault underneath those safety related SSCs.

24 So first evidence, the boring indicates

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1 subsurface stratigraphic continuity for the entire
2 site. I'll show you the profile in the next slide.
3 And also the Units 1-2 excavation, which we carried out
4 many, many years ago, indicates no growth fault
5 existence.

6 And since Units 1-2 construction, they
7 have many, many infrastructure built at the site, those
8 infrastructure which it's a time mark, basically.
9 They show no deformation since the 30 to 40 years time
10 period. And also the embankment of the MCR which is
11 closer to the GMO and GMP indicates no deformation.
12 Next, please.

13 So this is the Profile (a-a) constructed
14 for the site. The red line goes all the way across the
15 entire site. And this is the Unit 3 & 4. This is the
16 Unit 1-2. This is a comprehensive profile constructed
17 for the entire site based on the boring from those
18 units, Units 1-2 and Units 3 & 4.

19 You see very dense populated, the boring
20 logs, and also there are two small profile at the Units
21 3 & 4 sites. Next, please.

22 That's the (a-a) profile across both Units
23 1-2 and Units 3 & 4. So you see the stratigraphic
24 continuation. There's no displacement on those

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1 layers, so that's an indication that those faults did
2 not come to that shallow part of the profile. Next,
3 please.

4 So here's the animation you expected.

5 MEMBER STETKAR: Mike, it's time to get
6 excited.

7 MR. LI: Yes, so this is a growth fault at
8 the site, basically just a simple sketch here. And
9 then you have erosion, then you have another layer
10 deposited on top of that. In this case it's called a
11 Beaumont Formation, top layer, Beaumont Formation.

12 Then the licensee drill many holes. In
13 both Units 1 & 2 investigation and in Units 3 & 4
14 investigation, they found the continuation of those
15 stratigraphic layers.

16 Then you also have many infrastructure
17 built after the Units 1 & 2, those, reservoir, you know,
18 different structures at the site didn't show any growth
19 fault onto the surface. That's the indication, yes.

20 CHAIRMAN CORRADINI: So you don't have to
21 go back to your exciting cartoon, but so what you're
22 saying is, even though things were mapped and various
23 test holes were taken, they haven't seen any
24 deformation on the surface to date?

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1 MR. LI: Yes.

2 MEMBER BLEY: I'm just trying to get a
3 picture of this. Can you go back to the picture you
4 just showed? Now you showed us that yellow layer which
5 that's a soil layer?

6 MR. LI: A soil layer. It's called a
7 Beaumont Formation. The top layer, Beaumont is --

8 MEMBER BLEY: The one above that, that
9 kind of gray before you get to the structures, is that
10 a fill or something, or what is that?

11 MR. LI: No, this is just a simple sketch
12 I constructed to symbolize --

13 MEMBER BLEY: That doesn't really mean
14 anything then?

15 MR. LI: No, no, sorry. This is very, not
16 one-to-one comparison. Let's put it that way, yes.
17 No, it's just a simple sketch, indicates there's
18 different infrastructure at the sites shows no sign of
19 deformation.

20 MEMBER BLEY: And just on this picture,
21 what's the depth of the pond, the reservoir? Does it
22 go below the other layer?

23 MR. LI: The pond.

24 MEMBER BLEY: The main cooling reservoir.

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1 MR. LI: No, this is just a simple sketch.
2 It's not --

3 MEMBER BLEY: I know, but it represents
4 something.

5 MR. LITEHISER: It's a perched pond. It
6 sits on top of all of that.

7 MEMBER BLEY: Yes, that's what I thought.
8 Thank you.

9 MALE PARTICIPANT: It's a what pond?

10 MR. LITEHISER: Perched. It's basically
11 floating --

12 MR. LI: Yes, I have a picture showing that
13 too.

14 MEMBER BROWN: For the simple minded like
15 me, you say there's a solid Beaumont layer?

16 MR. LI: Beaumont layer.

17 MEMBER BROWN: And then the
18 sedimentations, the little yellow lines, and then the
19 sliding part? I'm trying to get something out of this
20 on a qualitative basis. This lower fault has not
21 deformed that Beaumont layer, so it's stable even
22 though you've got this sliding --

23 MR. LI: It's been capped by the younger
24 layer. Let's it put it that way.

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1 MEMBER BROWN: Okay, so it's stopped and
2 it's not deforming the upper layer.

3 MR. LI: Exactly.

4 MEMBER BROWN: Okay. Thank you. I
5 didn't understand much of what you said before, but that
6 part I understand.

7 MR. LI: That has it all there.

8 MEMBER BALLINGER: How thick is that
9 layer? The Beaumont?

10 MR. LI: The Beaumont? Very thick.
11 It's, I mean, it's off --

12 MEMBER BALLINGER: A hundred feet.

13 MR. LI: Yes.

14 MEMBER BALLINGER: Okay. That gives me a
15 scale for what's going on.

16 MR. LI: So then next concern is the, hub
17 at the MCR. Because the growth fault is so close to
18 the MCR, Main Cooling Reservoir. But the MCR was put
19 into the operation in 1983. Actually I saw some the
20 FSARs.

21 The investigation started from '81, '82.
22 And all the MCR relate to structure observed no
23 defamation. So that embankment, and other associate
24 structure abut there as a marker, you know. There's

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1 no breakup by the growth fault. Even the growth fault
2 is little closer to the site.

3 But remember, the measurements at the
4 reservoir was showing no defamiation. But little
5 further away three sites showed the terrain
6 deformation. And also, another factor is that we need
7 to consider, even those growth faults, GMP, GMO are,
8 or become active.

9 The moving rate is so small that the site
10 safety, in this case we talking about the MCR, which
11 can be breached, will not be, the safety be will not
12 be significantly affected, from the safety related
13 structure sitting on the north side of the MCR. That's
14 the embankment of the MCR, you know. It's, you see
15 those patterns, step by step. They never show any
16 growth fault sign. Next please.

17 MR. HINZE: You're also really near the
18 edge of the growth fault. And the rates are usually
19 lower there than they are in the scoop of the listric
20 fault. That maybe explained part of your topographic
21 expression --

22 MR. LI: Okay.

23 MR. HINZE: -- away from that site at the
24 ends.

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1 MR. LI: Yes, okay. Yes.

2 MR. HINZE: Because it's scooped. That's
3 where the name listric comes from.

4 MR. LI: Yes. So here comes our
5 conclusion on the growth faulting at the STP Unit 3 and
6 4. The applicant incorporate range of appropriate
7 methods to evaluate any potential for surface
8 defamation due to growth faulting at the STP site.

9 There's no evidence of growth faulting
10 that would pose a hazard to safety related structures.
11 And also, the geological mapping licensing condition
12 would include in the COLA growth check for faulting on
13 the safety related structure, including growth faults
14 in the future when the construction's started.

15 MS. GOVAN: Are there any --

16 MR. LI: Next please.

17 MS. GOVAN: That's the end of that
18 presentation.

19 MR. LI: Oh, okay.

20 MS. GOVAN: Is there any questions
21 relating to geological mapping, the license condition,
22 or Action Item 96?

23 MR. HINZE: I've got a couple. Just a
24 minor thing. On Page 7 and 14 of the SER there's some

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1 statements regarding the thickness of the cenozoic
2 faults beneath the site. And they are inconsistent.
3 And I don't know whether this is a typographical error,
4 or what the problem is.

5 MR. LI: In the --

6 MR. HINZE: But it's the depth of the
7 cenozoic sediments underneath the site. And that's on
8 Page 7 and 14 --

9 MR. LI: SER?

10 MR. HINZE: -- of the SER. That is
11 correct.

12 MR. LI: Okay. We take note that. We
13 double check, we're going to double check that.

14 MR. HINZE: Okay, yes.

15 MR. LI: Yes.

16 MR. HINZE: And also, on Page 85 I think
17 you've got a problem with kilometers and miles. But
18 that's a minor editorial glitch. One of the things
19 that we have seen in the seismic activity in the central
20 part of the United States is an increase in the plus
21 3 magnitude earthquakes, since about 2009.

22 What we've seen is that there is an
23 increase from about 20 plus 3 magnitudes per year in
24 2009, to up to 100, a five fold increase. And I think

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1 seismologists are scratching their head why this is
2 going on.

3 But one of the prominent reasons for
4 hypothesis for the explanation of this is that this is
5 due to the injection of, particularly of fracking of
6 fluids, fluids that are being taken out of the wells
7 that are being fracked.

8 And I brought up a map of the injection
9 wells, the disposal wells in Texas. And there are a
10 large number of disposal wells that exist in the
11 vicinity of the STP site. I have not really mapped the
12 specific site with them. But I can show you a map. Or
13 you can bring it up from the Texas Railroad Commission
14 yourself.

15 And that result is, I'm wondering whether
16 we can anticipate any increase in the plus 3 magnitude
17 earthquakes in the vicinity of the site, as a result
18 of any increased injection of fluids into the
19 subsurface, and whether this has been taken into
20 account?

21 I note in the FSAR and the SER that there's
22 a brief mention that there's really no human activity
23 that is of concern. But this is a potential concern.
24 And I'm wondering if there needs to be a more complete

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1 consideration of that in the 2.5 SER?

2 MR. LI: To answer that question, I think
3 the hydrofracking is already, I mean, it's been paid
4 attention to.

5 MR. HINZE: I'm not talking about
6 fracking.

7 MR. LI: I know.

8 MR. HINZE: Because those magnitudes are
9 --

10 MR. LI: Are long, right.

11 MR. HINZE: -- generally less than three.

12 MR. LI: Yes.

13 MR. HINZE: I'm talking about the plus 3,
14 including the Oklahoma earthquake of two years ago that
15 was a 5.6, that is, according to many of the experts
16 working in the area, associated with injection of
17 fluids.

18 MR. LI: But that's under discussion
19 though.

20 MR. HINZE: Oh, yes. It's under
21 discussion.

22 MR. LI: There's no certainty that fault,
23 that earthquake is definitely associated --

24 MR. HINZE: Absolutely.

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1 MR. LI: -- with fracking activity.

2 MR. HINZE: You're absolutely right.

3 MR. LI: Because you just actually --

4 MR. HINZE: But it --

5 MR. LI: -- do associate that with the
6 fault underneath that.

7 MR. HINZE: But it does, we're talking
8 about plus 3 magnitude earthquakes.

9 MR. LI: So basically, you're thinking
10 that we need to take a comprehensive consideration of
11 the earthquake with magnitude 3 and above in the whole
12 area?

13 MR. HINZE: Some recognition that there
14 are disposal wells in the area. And that up to this
15 time there have been no increase in the activity in the
16 vicinity of the STP site.

17 Now, if you move to the west, where there
18 is a lot of fracking going on in the Eagle Ford
19 formation, there is, in the injection of wells there's
20 been quite an increase in the plus 3 magnitude
21 earthquakes since 2009. And, you know, are you
22 considering those in your evaluation?

23 MR. LI: If I understand correctly, our
24 earthquake catalogue cutoff is beyond the 2009. So if

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1 you're talking about a magnitude 3 and above, that
2 should already be included in the seismicity, I mean,
3 in term the occurrence rate at the smaller magnitude
4 site. It's already included.

5 MR. HINZE: Well, as I recall the cutoff
6 on the CEUS, the new earthquake catalogue that's part
7 of --

8 MR. LI: Bob Young's --

9 MR. HINZE: Yes.

10 (Crosstalk)

11 MR. HINZE: I think that's an '08.

12 MR. LI: Okay.

13 MR. HINZE: But there have been a number
14 of earthquakes of plus 3 in just, you know, 100 miles
15 to the west of the STP site, some 75, 100 miles. I bring
16 this up because I wonder whether there needs to be a
17 consideration, or at least a mention of this, that
18 you're taking this into account in your evaluation.

19 CHAIRMAN CORRADINI: So, can I ask you a
20 question. Or can I just get a clarification of your
21 question differently, Bill? So you're not necessarily
22 saying that this has a, directly an effect. But you
23 want to make sure that it's being considered within the
24 analysis.

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1 MR. HINZE: That's, and being evaluated.
2 It's important that anyone looking at this ten years
3 down the pike will know that this was something that
4 didn't just slip between the cracks. But it was being
5 considered and evaluated. And that there were these
6 large number of disposal wells in the immediate
7 vicinity.

8 CHAIRMAN CORRADINI: Yes.

9 MR. HINZE: I don't think it's, there's no
10 evidence that it is a problem at this point.

11 CHAIRMAN CORRADINI: But on the other
12 hand, you want to make sure it's been evaluated.

13 MR. HINZE: Exactly.

14 MR. LI: I think as the next generation of
15 the seismic catalogue released that anything like
16 bigger than magnitude 3 will be taken into
17 consideration for the magnitude, and for the occurrence
18 basically. We will not exclude anything occurred with
19 a magnitude 3 and above. Let's put that away.

20 CHAIRMAN CORRADINI: Okay. But I don't
21 think you guys are -- I think what he's asking and what
22 you're answering aren't matching up. I think what he's
23 asking is, have you evaluated. And I hear you saying
24 it will be evaluated. So I think the answer to his

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1 question is no.

2 MS. KARAS: This is Becky Karas. I'm a
3 branch chief in the division of --

4 CHAIRMAN CORRADINI: Oh, okay.

5 MS. KARAS: -- safety and environmental
6 analysis. I just wanted to clarify, Dr. Hinze, what
7 you're asking. What I'm hearing, you're going to hear
8 from Sarah Tabatabai, who's the seismologist who
9 evaluated this CEUS-SSC. You're going to hear from her
10 in the next presentation.

11 And I want to be sure. Because it seems
12 like your line of questioning about the nearby wells
13 is related to possible changes in seismicity. And then
14 I think I heard a concern that CEUS-SSC on the catalogue
15 cutoff date.

16 And then you were concerned if future
17 changes in seismicity, specifically back into the
18 seismic hazard calculations for the site. Is that
19 correct?

20 MR. HINZE: That's right. Right. That
21 is correct.

22 MS. KARAS: Okay. So a couple of things.
23 First of all, if you can hold to Sarah's presentation,
24 she'll discuss what she did in terms of CEUS/SSE, and

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1 the catalogue for that.

2 But then also remember that one of the
3 recommendations of the interim task force for Fukushima
4 was to look in Recommendation 22, and potentially
5 whether or not we need to re-look at seismic hazard,
6 some periodic basis for sites. So that's still
7 obviously under consideration.

8 The Commission's deciding what it will do
9 in terms of a periodic re-look for any of the sites.
10 But in terms of what we're doing for this site today,
11 and the information that's available, Sarah will talk
12 to you about, you know, what the staff's done, what
13 earthquake catalogue level that went up to in terms of
14 that.

15 But for future looks I think, you know,
16 that recommendation is still playing out as to what's
17 going to happen with that.

18 MR. HINZE: Well, I appreciate what you're
19 saying, and the information that we'll be receiving is
20 important. One of my points here is that in 2.5, that
21 it would be good to understand, and to recognize that
22 there are the disposal wells. And that we are not
23 seeing any earthquakes occurring as a result of that.
24 It's a matter of recognition of a potential problem.

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1 MS. KARAS: Okay. Okay. So you're
2 looking for something that basically acknowledges the
3 fact that CEUS-SSC used earthquake catalogues --

4 MR. HINZE: No.

5 MS. KARAS: -- up to that date?

6 MR. HINZE: No, no. It's the fact that
7 there are injection wells in the immediate vicinity of
8 STP. They are not causing any earthquakes. And
9 therefore, that this is a, has been evaluated, and has
10 found to be not of concern to the STP site.

11 MS. KARAS: So you're looking beyond it
12 being considered in the seismic hazard calculations?

13 MR. HINZE: That's right.

14 MR. LI: That part, I think it was
15 discussed in the human activity, you know, potential
16 hazard imposed by the human activity. That part was
17 --

18 CHAIRMAN CORRADINI: That's in the SER?
19 Then I missed it. I'm sorry.

20 MR. LI: Yes, it's in the SER.

21 CHAIRMAN CORRADINI: It's in the SER?

22 MR. LI: Yes.

23 CHAIRMAN CORRADINI: Oh, okay.

24 (Off microphone comments)

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1 CHAIRMAN CORRADINI: Got it.

2 MR. LI: And I think that --

3 MR. HINZE: It's a recognition that --

4 MR. LI: Okay.

5 MR. HINZE: -- there is no problem from the
6 potential concern.

7 MR. LI: Yes, okay.

8 MR. HEAD: Mr. Chairman, can I just offer
9 one clarification?

10 CHAIRMAN CORRADINI: Sure. I'm sorry.

11 MR. HEAD: Disposal wells and fracking are
12 not the same thing.

13 CHAIRMAN CORRADINI: Understood.

14 MR. HEAD: Okay. I just wanted to make
15 sure. And there are some disposal in the -- And your
16 point that they haven't caused anything is valid. The
17 fracking is over 80 miles away. And it's --

18 MR. HINZE: That's a different problem.

19 MR. HEAD: Okay. Okay.

20 MR. HINZE: And the earthquakes generally
21 don't get above 2.5 from that. So fracking is not a
22 problem.

23 MR. HEAD: Okay.

24 MR. HINZE: It's the disposal.

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1 MR. LI: Injection well. That's the
2 problem.

3 MR. HEAD: That's the problem that we've
4 seen nothing of in the area.

5 MR. HINZE: Right.

6 MR. HEAD: So that's your point, is it?

7 MR. HINZE: Yes. You know, I'm going to
8 apologize for bringing up what maybe is a minor point.
9 But what I'm trying to do is to make certain that what
10 we've done is we've covered all the bases.

11 And with a brief sentence or two in there,
12 that could be done, where the human activities is
13 discussed. Because the human activities does not go
14 far enough in this discussion, in my view.

15 MR. LI: You don't have to apologize.
16 It's a good point. I mean, we always pay attention at
17 those things. That's for sure.

18 MS. BANERJEE: Are we taking these as an
19 Action Item, then?

20 CHAIRMAN CORRADINI: On that? No. No.
21 We're going to wait to hear the additional --

22 MS. BANERJEE: Sarah coming?

23 CHAIRMAN CORRADINI: Yes.

24 MS. BANERJEE: Okay. Thanks.

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1 MS. GOVAN: All right. So we're going to
2 move on with our presentation. For Section 2.2 there
3 are no Action Items associated with this section.
4 However, 2.5.2 has a pointer for a recommendation 2.1.

5 And that presentation, as I said earlier,
6 will be presented after the break for today. And so
7 now we'll move on to Frankie Vega, who will give us the
8 staff evaluation of Section 2.5.4.

9 MR. VEGA: Hi. And the next two slides,
10 going over the backfill issue that was identified as
11 part of the Section 2.5.4. And it wasn't discussed at
12 the previous NCRS presentation back in November of
13 2010. This open item has been resolved, and has been
14 documented in the staff safety evaluation.

15 This issue is related to the structural
16 backfill that will be placed underneath several safety
17 seismic Cat 1 structures. These are light weight
18 structures, specifically the RSW tunnels, and the
19 diesel fuel, oil storage vault. The reactor building
20 itself, it will be placed on a concrete fill, under a
21 very stiff clay.

22 In our request 02.05.04-37 the staff
23 requests that the applicant provide the types and tests
24 and frequency of testing that will be used to define

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1 the engineering properties of the backfill. These
2 details were to be included as part of the, you know,
3 the backfill ITAAC, as with the ITAAC 3.0-11.

4 This ITAAC also included an assessed shear
5 weight velocity and density requirements. And what
6 the impact was of the ITAAC was to verify the as-built
7 properties, bound the assumed engineering properties.

8 Part of the resolution, the application
9 agreed to modify the ITAAC to include the types of test
10 and frequency of tests to be performed in the field to
11 verify that as-built properties bounded the assumed
12 engineering properties.

13 As part of the ITAAC acceptance a criteria
14 engineering report would exist that includes that the
15 engineering properties of backfill to be under seismic
16 Cat 1 structures meet the values assumed in the site
17 specific analysis.

18 The staff is confident that, you know, that
19 the ITAAC will ensure that the borrowed material
20 properties are consistent with those assuming the
21 design. And given that the, you know, high margins of
22 safety exist for those seismic Cat 1 structures, it will
23 ensure the performance under static dynamic loading
24 will be satisfactory.

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1 And the staff will feel confident that the
2 information provided in the ITAAC will ensure that, you
3 know, the properties would be, you know, bounded by
4 those assuming the design.

5 MS. GOVAN: Any questions relating to
6 2.54?

7 CHAIRMAN CORRADINI: Questions by the
8 committee?

9 MS. GOVAN: So that concludes our
10 presentation for Chapter 2.5. We hope that this closes
11 out Action Item 96, based on Dr. Yong Li's presentation.

12 We have one Action Item that we noted
13 relating to inconsistencies in documentation in the
14 staff safety evaluation for Pages 7 and 14, as well as
15 some inconsistency on Page 85.

16 CHAIRMAN CORRADINI: Let's not call those
17 action. Let's call those typos that you'll fix. And
18 I don't want to hear about it again.

19 MS. GOVAN: Thank you. That's even
20 better. So we will take care of it in the next revision
21 of our SER. Thank you very much.

22 CHAIRMAN CORRADINI: Now, so let me make
23 sure though. We're going to take up -- The staff's
24 intent was we'll take a break. But what you want to

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1 do now is take up Fukushima after the break. Is that
2 correct?

3 MS. GOVAN: Correct. Yes.

4 CHAIRMAN CORRADINI: Okay. So we're a
5 little bit ahead, a few minutes ahead. Why don't we
6 take a break now, and come back at 10:30 a.m.

7 (Whereupon, the meeting in the
8 above-entitled matter went off the record at 10:16 a.m.
9 and back on the record at 10:33 a.m.)

10 CHAIRMAN CORRADINI: We're now on the
11 record.

12 MEMBER STETKAR: I have a book for you, on
13 the record.

14 CHAIRMAN CORRADINI: Okay. We're back in
15 session. Tom.

16 MR. TAI: Okay. Good morning. My name
17 is Tom Tai. I'm Department Manager for STP projects.
18 Today we need to talk about Chapter 22.1, Fukushima,
19 Near-Term Task Force Recommendations.

20 We are presenting 2.1, which is seismic and
21 flood re-evaluations, 7.1 which is Spent Fuel Pool
22 Instrumentation, and 9.3, EP. And the reviewers for
23 those, and for 2.1 the reviewer is Sarah, next to me
24 and Rebecca, and Diane Jackson. I think I'll start a

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1 little bit out of order.

2 FEMALE PARTICIPANT: That's where I
3 start.

4 MR. TAI: Yes, it is. I can back up. I
5 think I'll start a little bit out of order. My original
6 intent was to, because we have a lot of questions.

7 And I know we're going to have a lot of
8 discussion on 2.1. My original intent is to switch up
9 the order, to talk about 7.1 and 9.3 first, because they
10 are a little simpler than seismic.

11 CHAIRMAN CORRADINI: That's fine.
12 You're in charge. You do what you think is best.

13 MR. TAI: Okay. Let me jump all the way
14 to -- This is not the slide that the package is about.

15 CHAIRMAN CORRADINI: I think all you have
16 is 22., you have your first part of the day. We just
17 have, all the time the thing that you've been scrolling
18 through is just 22.1.

19 MR. TAI: That's correct.

20 CHAIRMAN CORRADINI: And you want to find
21 22.3 and 4 somewhere.

22 MR. TAI: Let me use my disc.

23 MEMBER STETKAR: We don't have those.

24 CHAIRMAN CORRADINI: Yes, we do.

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1 MS. GOVAN: Do you have your disc.

2 CHAIRMAN CORRADINI: At the very end,
3 don't we?

4 MEMBER STETKAR: There's one slide. It
5 just says one page. No open items.

6 CHAIRMAN CORRADINI: Is that all you want,
7 Tom, is just that one slide?

8 MR. TAI: First 7.1, then 9.3, one slide
9 each.

10 CHAIRMAN CORRADINI: Oh, okay.

11 MS. BANERJEE: It's not in the handout.
12 It has only one --

13 MR. TAI: It should be in the handout.
14 That's correct.

15 CHAIRMAN CORRADINI: That's okay. We
16 don't have it. But we trust that we will see it when
17 you put it up there.

18 MR. TAI: Okay. There you go.

19 MS. BANERJEE: Okay.

20 MR. TAI: And these slides will be, I'll
21 give to you again, Maitri, for the record. A little
22 background. On March 11, 2011 Fukushima happened.
23 And 90 days later we issued a 90 day report in
24 SECY-11-0093. And the staff made 12 recommendations

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1 for the Commissioners for licensees and applicants to
2 take action, for consideration anyway.

3 December 9, 2011 SECY-11-0124 identified
4 12 -- And I'm sorry. SECY-0093 made 12 recommendations
5 for actions. And 0124 highlights seven of the 12 for
6 applicant to take actions. Today we will talk about
7 three of those seven. The other four either is not
8 applicable to STP, or the other initiatives.

9 FEMALE PARTICIPANT: Page 4.

10 MR. TAI: And October 3rd we issued
11 SECY-0137, add two more recommendation. One of them
12 is 7.1, which is Spent Fuel Pool Instrumentation. And
13 I'll check at 21, 22. And in February of 2012,
14 SECY-11-0025 proposed two orders. And that's where we
15 start our review.

16 STP project issued the first set of RAI.
17 We sent four RAI to the applicant, one for each
18 recommendation for them to take action. And in June
19 STP sent us the response. And in it, it added Appendix
20 1 after it to the FSAR. And let me echo what Scott just
21 said.

22 If you don't get STP application,
23 everything that you need to know about Fukushima is in
24 Appendix 1 echo. But the agency decided that we want

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1 to put all the Fukushima evaluations in one place. So
2 instead of embedding the measure in Chapter 1, we call
3 it Chapter 22. So really, you never going to find
4 Chapter 22 (in FSAR).

5 And other design same approach, use
6 Chapter 20, the one that they're not using for now. And
7 recommendation 4.2, which will be Chapter 22.2 will be
8 presented to ACRS in September.

9 Recommendation 7.1 Spent Fuel Pool
10 Instrumentation. In their response to our RAI, STP
11 provided an Appendix 1 Echo 2.6, a description of the
12 spent fuel pool instrumentation. And they made some
13 design improvement. And you heard that from Scott
14 earlier.

15 Like for instance, two channels, safety
16 related battery power, back up by diesel, mounting and
17 layer arrangement or separations, and missile
18 protections. So we are happy with the way they provide
19 us. And they added an ITAAC 3.0-28, just to make sure
20 that everything they provided us in 1 Echo 26 is met
21 when they finish in the as-built condition.

22 Do you have any questions on 7.1? Nine
23 point three. In response to the RAI on 9.3 there's
24 really not a whole lot for them to do right now. They

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1 follow NEI 12-01 to do, it says the staffing and
2 communication.

3 So what we have is, the applicant is
4 proposing an ITAAC to take care of the on-site, off site
5 communication capability for an extended loss of AC
6 power, and to look at the on-site staffing requirements
7 in the multi-unit events.

8 Staff thinks the license condition is more
9 consistent of other NEI initiative. But they're going
10 to be doing the same thing. And that's where we are
11 right now with 9.3. Any questions on 9.3?

12 CHAIRMAN CORRADINI: Questions by the
13 committee? No?

14 MR. TAI: Two point one. That's what
15 you're here for. Yes.

16 MS. TABATABAI: So this is the outline of
17 my presentation. And first of all I'm just going to
18 discuss a little bit of background related to the
19 seismic hazard re-evaluation. I'll just give a quick
20 summary of the CEUS-SSC model in the context of the STP
21 site.

22 Then I'm going to just summarize what the
23 applicant did as far their seismic hazard
24 re-evaluation, for what they did. Then I'll just

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1 summarize how we reviewed their response to the RAI.
2 And then I'll present our conclusions. Next slide,
3 please.

4 So the STP 3 and 4 COL FSAR, Section 2.5.2
5 GMRS is based on the updated EPRI 1986 seismic source
6 model and the EPRI 2004, 2006 ground motion model. So
7 ACRS Action Item Number 97 asked us, will it be
8 necessary to determine the impact of the new seismic
9 source mode on the results obtained using the EPRI SOG
10 model?

11 And the answer to that is yes. There was
12 an RAI issued in May 2012, to the applicant, which
13 addressed Recommendation 2.1 of the Fukushima
14 Near-Term Task Force recommendations. And that
15 requested the applicant to evaluate the potential
16 impacts of the CEUS-SSC model on the seismic hazard at
17 the STP site. And then if necessary, modify their
18 original GMRS and FIRS.

19 And our review of that RAI response is
20 documented in SER Section 22.1. So I'm just going to
21 summarize what we did for our review in the next few
22 slides. It just, first of all, a brief summary of the
23 CEUS-SSC model.

24 There are three main types of seismic

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1 source models, seismic source zone models in the
2 CEUS-SSC model. The first ones are Mmax zones. The
3 next one is seismotectonic zones. And the third one
4 is the repeated large magnitude earthquake sources.
5 And I'll just briefly explain those in the next few
6 slides.

7 But this logic tree, go back, yes, presents
8 the framework of the CEUS-SSC model. Basically
9 there's two main alternative branches of the logic
10 tree. And it separates the seismotectonic zones from
11 the Mmax zones and the RLME zones.

12 And it appears on both branches of this
13 logic tree. Because the data that was used to develop
14 these sources is basically independent from the other
15 two source sites. Next slide.

16 So this figure shows the different RLME
17 source zones. And those source zones are defined as
18 sources having had two or more earthquakes within that
19 moment magnitude greater than 6.5 in the historic
20 paleo-earthquake record. And the RLME source that
21 dominates the STP site, which is depicted by the red
22 star is the New Madrid fault source.

23 It dominates the hazard at the site. And
24 this figure also shows, the blue star is the Houston

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1 Test Site location, which you'll see in the later
2 slides. That is important for how the applicant did
3 its calculation for the GMRS. And we also used the
4 results from that site as well, to confirm some of it.

5 So next slide, please. This slide
6 illustrates the Mmax source, one of the alternative of
7 the Mmax source zones. And these source zones only
8 consider the potential differences in maximum
9 magnitude for the finding alternative source zonation
10 models. And the STP site is located in the source zone
11 that's called the mesozoic and younger extended zone.

12 And the other big zone above that is the
13 non-mesozoic and younger extended zone. So basically,
14 the STP site is in an area more extended across. So,
15 next slide. This one is --

16 CHAIRMAN CORRADINI: You're making that
17 noise.

18 MS. TABATABAI: Oh, I'm sorry. I didn't
19 realize it was me.

20 CHAIRMAN CORRADINI: Don't worry about
21 it.

22 (Laughter)

23 CHAIRMAN CORRADINI: We have a -- I was
24 going to say we have a hearing loss issue. But no

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1 problem.

2 MEMBER STETKAR: What?

3 MS. TABATABAI: Okay.

4 MR. HINZE: It was like construction going
5 on right above us, or something.

6 MS. TABATABAI: All right. I'm sorry.

7 CHAIRMAN CORRADINI: Don't worry about
8 it.

9 MS. TABATABAI: Okay. So this slide
10 shows the third type of zone, which is the
11 seismotectonic zones model. And basically these zones
12 are based on more regional differences in
13 seismotectonic data. And the STP site is located in
14 Gulf Coast highly extended crust. So, next slide.
15 Okay, so --

16 CHAIRMAN CORRADINI: So I have a question,
17 since you're talking about all sorts of stuff I don't
18 understand. So, you've divided the region into two
19 zones. Then you go further and divide it into more
20 sub-zones. The reason for that is what? I didn't
21 catch it.

22 MS. TABATABAI: Well, they're basically
23 alternative characterizations of source zones for the
24 central and eastern United States. So that the --

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1 CHAIRMAN CORRADINI: So two different
2 ways of looking at it?

3 MS. TABATABAI: Yes, two different ways of
4 looking at how to characterize source zones.

5 CHAIRMAN CORRADINI: That goes back to the
6 branching on slide 10?

7 MS. TABATABAI: Yes, yes. And then the
8 RLME sources are independent of that characterization.
9 They appear on both branches.

10 CHAIRMAN CORRADINI: Okay.

11 MS. TABATABAI: Because they're based on
12 paleo-seismic data.

13 MEMBER STETKAR: So what do the .4 and .6
14 mean on this? Weighting, I assume.

15 MS. TABATABAI: Oh, that's how they were
16 weighted. The source, the seismotectonic zones were
17 weighted slightly more, because they involved more
18 data. More data went into the development of these
19 source zones.

20 CHAIRMAN CORRADINI: And this is just a
21 consensus view on how to attack it?

22 MS. TABATABAI: Yes. That's how they,
23 that's the framework of the model.

24 CHAIRMAN CORRADINI: Okay, got it. Thank

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1 you.

2 MS. TABATABAI: Okay. So, I'm just going
3 to summarize what the applicant did. So basically,
4 they evaluated the potential impact of the CEUS-SSC
5 model on the characterization of seismic hazard at the
6 STP site, by using the 1, 10, and 100 Hertz hard rock
7 hazard curves for the nearby Houston Test Site.

8 And they did that instead of doing the
9 actual calculation for the STP site. They concluded
10 that both sites share similar geologic and tectonic
11 settings. And they also have similar activity rates.
12 They also estimated a 30 Hertz hazard values by using
13 ratios for, the PGA to 30 Hertz STP ratio from the FSAR,
14 and applied that to the Houston Test Site PGA value.

15 Because that only provided three hazard
16 values. So they got a fourth by estimating with this
17 ratio. And then from it, these hazard curves, they
18 developed a hard rock hazard curve for the Houston Test
19 Site. But then they applied the STP soil amplification
20 factors to this, these hard rock hazard curves to get
21 a site specific GMRS for the STP site.

22 And this is their results, which you've
23 already seen. They concluded it's very, very close to
24 the original GMRS in the FSAR. So it didn't merit any

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1 updates, based on this comparison. So too, we did a
2 few different confirmatory analyses to kind of, to
3 review what they did.

4 The first one was, we wanted to confirm
5 their assumption that the Houston Test Site curves are
6 appropriate for representation of the South Texas site.
7 So we did a PHA. We used the CEUS-SSC model, along with
8 the EPRI 2004, 2006 ground motion model. And we
9 compared the 1, 10 and 100 Hertz hazard curves with the
10 Houston Test Site results contained in the NUREG-2115
11 report.

12 And the curves are very similar. The STP
13 site hazard curves are slightly lower. So based on
14 this comparison we concluded that the Houston Test Site
15 was an adequate substitute for performing the hazard
16 at the STP site. I just want to note here that --

17 MEMBER BROWN: Can I, I'm trying to
18 understand. I'm, like the Chairman, not very
19 knowledgeable.

20 MS. TABATABAI: Right.

21 MEMBER BROWN: But Houston was about 200
22 miles away from the STP site?

23 MS. TABATABAI: I believe it's about 80
24 miles.

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1 MEMBER BROWN: Eighty? I just did a quick
2 eyeball scale on your thing, from the little thing at
3 the bottom. So I obviously got it wrong. So the
4 object of this analysis was to say the characterization
5 of the Houston site --

6 MS. TABATABAI: Yes.

7 MEMBER BROWN: -- is suitable to be
8 applied to the STP site? Is that --

9 MS. TABATABAI: Yes. Because the results
10 were similar.

11 MEMBER BROWN: So even though they're 80
12 miles away. But is the land characteristics
13 underneath and around the STP site identical?

14 CHAIRMAN CORRADINI: That's where he said
15 the soil part.

16 MS. TABATABAI: Well --

17 CHAIRMAN CORRADINI: They took their soil
18 --

19 MS. TABATABAI: That's right. But the
20 seismic sources as, you know, the previous slides where
21 you can see the CEUS-SSC source zones. STP and Houston
22 are located in the same source zones.

23 MEMBER BROWN: They're pretty close.

24 MS. TABATABAI: Yes.

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1 MR. HINZE: Compared to the sources. The
2 geologic and tectonic zones are the same really.

3 MS. TABATABAI: Yes.

4 MR. HINZE: And there are salt intrusives
5 in the Houston area. There are salt intrusives in the
6 STP area.

7 MEMBER BROWN: Okay. I just got to make
8 sure I understood.

9 CHAIRMAN CORRADINI: So it's a suitable
10 surrogate.

11 MEMBER BROWN: Okay. That's fine. I
12 just want to make sure I understood the
13 characterization.

14 MS. TABATABAI: And I just want you to know
15 also that we used, at the time I did this calculation
16 we only had the background seismic sources in the
17 software, like the Mmax and the seismotectonic source
18 zones.

19 We didn't have, we hadn't yet incorporated
20 the RLME sources in the hazard code. However, we
21 concluded that that was okay, because both sites are
22 pretty far from the New Madrid fault source. And the
23 Houston Test Site is actually a little closer.

24 CHAIRMAN CORRADINI: Okay.

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1 MS. TABATABAI: So we figured, you know --

2 CHAIRMAN CORRADINI: And then just to
3 clarify, the second part, just to wrap up Charlie's
4 question. So the source characterization was moved
5 where there was more data. But they applied it
6 relative to the soils that are physically at Bay City?

7 MS. TABATABAI: Yes. Because, you know,
8 the soil column is different.

9 CHAIRMAN CORRADINI: Sure. Okay. Got
10 it.

11 MEMBER STETKAR: So, Sarah, before we get
12 to GRMS, GMRS, I always get that backwards. Go back
13 to your previous slide.

14 CHAIRMAN CORRADINI: You going to ask her
15 a question?

16 MEMBER STETKAR: Yes.

17 CHAIRMAN CORRADINI: I figured that.

18 MEMBER STETKAR: When you did your
19 confirmatory, you did an independent confirmatory
20 analysis. These plots only show the mean curves.

21 MS. TABATABAI: Yes.

22 MEMBER STETKAR: Did you run the
23 uncertainties out in your analyses?

24 MS. TABATABAI: Yes. But I didn't plot

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1 them or compare them for this purpose.

2 MEMBER STETKAR: Yes, you didn't. Could
3 we see those, please sometime?

4 MS. TABATABAI: Yes.

5 MEMBER STETKAR: If you could get those to
6 Maitri, or if you have them in the background.

7 MS. TABATABAI: Certainly.

8 MEMBER STETKAR: Now, let me, since we're
9 on this. Because you're going to go to the GMRS
10 comparisons. So I don't want to get off track too far.

11 Can you explain to me why, in NUREG-2115,
12 for the Houston site, the uncertainty remains rather
13 modest, and does not increase with increasing
14 acceleration for peak ground acceleration 1 Hertz, 10
15 Hertz, 100 Hertz? Because that seems contrary to
16 everything that I've ever seen. Can you explain to me
17 why that happens?

18 MS. KARAS: This is Becky Karas again. We
19 had a discussion with some of the people involved in
20 reviewing the NUREG, out in the hallway. They're no
21 longer available. They had to go to a different
22 meeting. But Dr. Li, who was presenting earlier, did
23 hear the explanation. And I probably wouldn't do it
24 justice.

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1 MEMBER STETKAR: Okay.

2 MS. KARAS: But just to sum up what I think
3 you're going to hear from him is that, if you looked
4 at say, like the Manchester Test Site, an area of higher
5 seismicity.

6 MEMBER STETKAR: I'm not asking about
7 Manchester. I'm asking about Houston.

8 MS. KARAS: Yes, I understand. If you
9 were to run that plot for Houston out to the level of
10 say ten to the minus ten, you would see the spreading
11 that you're looking for.

12 My understanding is it has to do with the
13 fact you're in a very low seismicity, very low hazard
14 area, where the aleatory uncertainty dominates to such
15 an extent.

16 MEMBER STETKAR: Okay. Why does the
17 aleatory uncertainty dominate, when in NUREG-2115 for
18 the Houston site -- Now it's all -- This one, I'll admit,
19 is a bit of a stretch. But there is a plot, and take
20 the reference number. It is, it's part of the Houston
21 analysis. It's Figure 8.2-3J.

22 And that compares the mean estimates from
23 the CEUS-SSC model in 2011, what's called the COLA model
24 of 2003 to 2009, USGS model EPRI, GM, over the range

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1 of acceleration from .01g to .1g.

2 And I see what I would expect that, over
3 that range the deviation among those three models
4 becomes much larger, even over that acceleration range,
5 down to ten to the minus 6. So I'm not looking at
6 accelerations like, you know 12g at ten to the minus
7 ten per year.

8 MEMBER BLEY: It's the same scale as these
9 plots.

10 MEMBER STETKAR: It's the same scale as
11 these. And I see three different models developed by
12 what I respect as three sets of really intelligent
13 people who understand this stuff, deviating as I would
14 expect them to deviate, as I get to accelerations for
15 which, especially at this site, we don't have a lot of
16 experience.

17 A 1g earthquake, you can't translate it
18 directly, obviously. But where we're talking about,
19 you know, Richter magnitude sevenish or so, to put it
20 in perspective. This is a big earthquake for this
21 site. And to say that we are, have the same uncertainty
22 for that acceleration, compared to a pretty doggone
23 small earthquake, to me doesn't seem right.

24 And I don't know what's in the computation

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1 process that homogenizes the uncertainty. So I don't
2 understand that. Because it's going on in NUREG-2115,
3 which is a big problem.

4 Because if there's, we need to understand
5 that generically. And we need to understand it for the
6 site. Because it sounds like everybody's using the
7 same models and the same algorithms.

8 MS. TABATABAI: Those are three
9 different, the different, the USGS model and the, those
10 are three different independent models. Whereas this
11 --

12 MEMBER STETKAR: Yes. Okay. Epistemic
13 uncertainty. How did you handle modeling uncertainty.
14 These are three different models by three different
15 sets of equally qualified experts, using fundamentally
16 the same data. Granted, some of them used a little bit
17 more from the Gulf of Mexico. But the basic seismic
18 sources that fed all of these are essentially the same.

19 And yet I look at tremendously increasing
20 uncertainties. So if I'm thinking about epistemic
21 uncertainty. And the source of epistemic uncertainty
22 is, in fact the modeling.

23 Or if I treat it in the context of the South
24 Texas FSAR, where I see six sets of experts using the

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1 same data with their own models, and I see the
2 increasing uncertainty among those six sets of experts.
3 Now using the same data at the same site, those experts
4 deviate at higher accelerations. And yet, the overall
5 hazard does not.

6 MS. TABATABAI: Well, this model is,
7 you're not looking at a weighted average of different
8 separate models.

9 MEMBER STETKAR: Okay. Now if you're --

10 MS. TABATABAI: You're looking at like --

11 MEMBER STETKAR: If you're arbitrarily
12 weighting the experts or the models that show
13 divergence, to downplay them because you want
14 homogeneity, I'd like to understand why. I mean, I
15 understand how people can say, well, we don't think that
16 that's correct.

17 MS. TABATABAI: Well, the CEUS-SSC model
18 was like, they're approach was a SSHAC Level 3. And
19 that was, from the start developed that logic tree.
20 And experts all helped develop those weighting schemes,
21 and everything like that. And then they had one model
22 at the end with different uncertainties.

23 MEMBER STETKAR: Let me ask you this. Has
24 anyone ever challenged you on this issue? All of these

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1 experts. Has anyone ever challenged you on this issue
2 of how uncertainties were treated?

3 MS. TABATABAI: Me? No, no.

4 MEMBER STETKAR: I mean, anyone involved
5 in this analysis process.

6 MS. TABATABAI: Well, it was the SSHAC
7 process, so --

8 MEMBER STETKAR: You know, I use a PC, some
9 people use a Mac. The tool is not what I'm asking
10 about.

11 CHAIRMAN CORRADINI: You're bothered by
12 the fact that --

13 MEMBER STETKAR: I'm bothered by the fact
14 that the treatment of the uncertainties seems both
15 counterintuitive on just a general sense. To say that
16 I had the same confidence in a very large acceleration
17 earthquake happening, compared to a very small
18 earthquake happening. But I have the same confidence
19 in that.

20 CHAIRMAN CORRADINI: So let me just --

21 MEMBER STETKAR: And it seems contrary to
22 the input information that I can see.

23 CHAIRMAN CORRADINI: But, can I just,
24 since we're, this is now becoming more generic. Just

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1 so I'm clear. So John's worried about it more for how
2 it's used as a guide for more than just STP.

3 MR. HINZE: Absolutely.

4 MEMBER STETKAR: Absolutely.

5 CHAIRMAN CORRADINI: Right?

6 MEMBER STETKAR: That's the big issue.

7 CHAIRMAN CORRADINI: And the question
8 really is, at least, seat of the pants makes you think
9 that as you get up in acceleration there ought to be
10 fundamentally greater uncertainties. So, Pete.

11 MEMBER RICCARDELLA: So, just to try to
12 cast your question. Are you saying that the way
13 they're doing it, if you plotted uncertainty lines on
14 this plot there would be lines above and below, that
15 would be parallel to this line?

16 MEMBER STETKAR: And indeed there are.

17 MEMBER RICCARDELLA: And it shouldn't be?
18 You're saying as they get down they should --

19 MEMBER STETKAR: Fan out.

20 MEMBER RICCARDELLA: -- fan out?

21 MEMBER STETKAR: Bingo.

22 MS. KARAS: My understanding is that if
23 you look at the other test sites in that document you
24 do see that divergence. And it's an artifact of the

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1 level of hazard and the level of seismicity in this
2 specific region, and where it's cut off.

3 MEMBER BLEY: Yes. But it really doesn't
4 make sense that in an area where we've got no experience
5 we have perfect certainty about what the hazards are
6 there.

7 MS. KARAS: My understanding is that if
8 you take to like ten to the minus ten you do see that.
9 I'm not the right person. And this is what I was told
10 in the hallway.

11 MEMBER STETKAR: Let's just leave it. It
12 is a generic concern.

13 MS. KARAS: I'll have to get with people,
14 clearly, who worked on the NUREG. We can get them to
15 answer --

16 MEMBER STETKAR: Okay.

17 MS. KARAS: -- that question. As a
18 takeaway, I think, is the best thing.

19 MEMBER STETKAR: That's fair enough.

20 MS. KARAS: But that's my understanding is
21 that we understand it. And we know why that plot looks
22 like it is. We just need to get the right people to
23 explain it to you.

24 CHAIRMAN CORRADINI: But just so I say it

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1 back. Your point is that eventually fans out at higher
2 accelerations and lower probabilities for this site.
3 But if one were to go to a different site you would see
4 this growth in uncertainties at lower accelerations and
5 higher frequencies? So it's site dependent?

6 MS. KARAS: That's my understanding, that
7 this was an artifact specifically in --

8 CHAIRMAN CORRADINI: So we've got to
9 double check that to understand it for how it fits into
10 2115?

11 MS. KARAS: I think we just need to be able
12 to explain it to you. And get the right --

13 CHAIRMAN CORRADINI: Okay.

14 MS. KARAS: -- person to explain it.

15 CHAIRMAN CORRADINI: Okay, good. That's
16 fine.

17 MEMBER STETKAR: I just took a look at the
18 Manchester site, because you mentioned that. I don't
19 see, I can't, I didn't extract the percentiles. So,
20 it's not obvious to me that it might be increasing down
21 at 1 Hertz. PGA doesn't, PGA might be increasing for
22 Manchester. I looked at Jackson, which is the next
23 one. And it seems flat.

24 MS. KARAS: And that's fine. They didn't

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1 have a chance to pull all the plots in hallway. But
2 they said that they thought they understood why we can
3 get them to come on that.

4 MEMBER STETKAR: Okay.

5 CHAIRMAN CORRADINI: Okay, good. Sarah,
6 you're back on.

7 MS. TABATABAI: Okay. So I had just
8 described my confirmatory analysis to determine
9 whether the Houston Test Site was a good surrogate for
10 the STP site. And we concluded that it was
11 appropriate.

12 And then I also did a confirmatory analysis
13 to determine the adequacy of the GMRS that the applicant
14 developed using this Houston Test Site model. So I
15 performed a confirmatory site response calculation.

16 And this plot shows the amplification
17 functions in comparison to what the applicant had
18 developed in the FSAR. And they're pretty similar. I
19 used these results, along with the Houston Test Site
20 rock hazard curves.

21 I used these because, I mentioned before
22 that we didn't actually have the full model at the time
23 I did this analysis. We didn't have the RLMEs, and I
24 wanted to look at, include that in the GMRS calculation.

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1 Since then we actually have available the full model.
2 So at the very end I'm going to show you a plot with
3 the full model.

4 But this is, here I also used, in my
5 calculation I used the Houston Test Site hazard curves
6 at seven frequencies. But I also used, instead of the
7 2004, 2006 ground motion model, I used the updated
8 ground motion model.

9 Because in the EPRI report of the updated
10 ground motion model. They had actually done a Houston
11 Test Site calculation using this updated ground motion
12 model. So I used those results instead. And those
13 weren't available at the time STP did their RAI
14 response.

15 And so this orange curve is my confirmatory
16 GMRS. And it's, overall it's lower, a lot lower than
17 the applicant's GMRS using, and the FSAR as well as
18 their updated GMRS for the STP site.

19 CHAIRMAN CORRADINI: So if I might just
20 ask, since we've got different colors and different
21 graphs? So what was the dashed blue line and the red
22 squares are the blue and the blue squares there?

23 MS. TABATABAI: Yes.

24 CHAIRMAN CORRADINI: And your calc is the

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1 orange?

2 MS. TABATABAI: Yes, that's correct. The
3 blue solid curve is the FSAR GMRS. The squares --

4 CHAIRMAN CORRADINI: They ask in their
5 presentation?

6 MS. TABATABAI: Yes.

7 CHAIRMAN CORRADINI: Got it.

8 MS. TABATABAI: And the squares are the
9 same. The squares are their updated GMRS. And the
10 green curve is the site specific SSE, which envelopes
11 everything.

12 CHAIRMAN CORRADINI: Got it.

13 MS. TABATABAI: And then, if I can move to
14 the next slide? This is, the red curve is the actual,
15 we did the actual full PSHA calculation for STP site,
16 using the updated EPRI 2013 ground motion models. And
17 it's lower still.

18 So we, based on that comparison we
19 concluded that the applicant's use of the Houston Test
20 Site hazard results, instead of directly performing the
21 hazard calculation at the STP site, is adequate. Our
22 confirmatory analysis showed that our results are
23 similar to or lower than the hazard at the Houston Test
24 Site.

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1 And so based on this analysis we confirmed
2 the applicant's conclusion that revisions to the STP
3 Unit's 3 and 4 COL FSAR GMRS weren't necessary.

4 CHAIRMAN CORRADINI: Can we just go back?
5 Maybe you know it. But the way you described it is --
6 Oh, I see. Excuse me. I misunderstood. So site
7 specific is the red line?

8 MS. TABATABAI: The dark red line is for
9 the STP site.

10 CHAIRMAN CORRADINI: Okay.

11 MS. TABATABAI: It's the GMRS for the STP
12 site.

13 CHAIRMAN CORRADINI: Then my question,
14 forget my question.

15 MS. TABATABAI: Okay.

16 CHAIRMAN CORRADINI: Okay. Thank you.
17 I misunderstood. Any questions from the committee on
18 this portion? So I have a question that has nothing
19 to do with this.

20 But I know you guys have tried to tutor us,
21 at least me in the eight years, twice. And I failed
22 the test. Is there some way that one can understand
23 how you walk through this calculation? Because to me
24 it still is a mystery.

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1 MS. TABATABAI: The calculation of --

2 CHAIRMAN CORRADINI: I mean, Becky I think
3 remembers. You once tried to tutor us on this.

4 MS. KARAS: Well I was going to say, we
5 have the SER package from maybe two or three years ago.

6 CHAIRMAN CORRADINI: And that's what
7 you're going to give me to re-learn it.

8 MS. KARAS: We had showed a couple, we
9 actually just finished writing up a, kind of like a PSHA
10 primer for the purposes of communications on what's
11 going on with the operating reactors.

12 CHAIRMAN CORRADINI: So, off line, if I
13 could at least have that, so that I can try one more
14 time? Maybe the third time's the charm.

15 MS. KARAS: Yes, sure. We can get you
16 some material on that.

17 CHAIRMAN CORRADINI: Okay. Thank you.

18 MEMBER RICCARDELLA: I'd like to see that
19 too.

20 MR. HINZE: Yes. Probably --

21 CHAIRMAN CORRADINI: Maybe the whole
22 committee would like to see that.

23 MR. HINZE: Sure.

24 MEMBER STETKAR: Absolutely. I'll put my

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1 --

2 CHAIRMAN CORRADINI: But there'll be no
3 test. There'll be no, I learned test though. Please.
4 We may never pass.

5 MS. KARAS: We can resurrect the slide
6 package too. Because I think that had pretty pictures
7 in it.

8 MEMBER STETKAR: We'll need pretty big
9 ones.

10 MS. KARAS: And graphs, and things like
11 that.

12 MEMBER STETKAR: That will be a humbling
13 experience.

14 CHAIRMAN CORRADINI: Any other questions
15 of Sarah? Okay. Good. Next. And so the only open
16 -- I won't use that word open, I get kind of crazy with
17 that. The only outstanding thing that we need to be
18 tutored on is for the site specifically, and 2115
19 generically, how our gut feeling is different, why our
20 gut feeling is different than what is plotted --

21 MEMBER RICCARDELLA: On the
22 uncertainties.

23 CHAIRMAN CORRADINI: -- for this site, on
24 the uncertainty fanning out.

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1 MR. HEAD: Mr. Chairman, can I ask, is that
2 -- We can come and discuss that in September. But it
3 sounds like this is really a more generic issue, or a
4 CEUS issue at the start.

5 MEMBER RICCARDELLA: Yes.

6 MEMBER STETKAR: If you use, you know, I
7 don't know what buttons you push on what computer
8 algorithm to run all of this stuff out of. If you
9 pushed the same buttons on the same computer algorithm
10 that's used in NUREG-2115, it's not your problem.

11 MR. HEAD: Well, that's kind of -- I guess
12 I'd like to be able to confirm that before we come back
13 in September.

14 MEMBER STETKAR: Yes. If you push
15 different buttons on a different computer algorithm to
16 generate your original curve, you know, what's
17 published in the original hazards that published in the
18 FSAR, then it's partly your problem too.

19 MR. HEAD: Well, we're going to pursue
20 your question about the, you know, the areas that are
21 out of the bound.

22 MEMBER STETKAR: Got it.

23 MR. HEAD: Okay. Thank you.

24 MEMBER RICCARDELLA: I think it's more of

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1 a generic question --

2 MEMBER STETKAR: Yes.

3 MEMBER RICCARDELLA: -- that we need to
4 get our arms around.

5 MEMBER STETKAR: We certainly need to get
6 around the generic issue for a broader context.
7 Because as all the other, as the sites, you know,
8 they've delivered at the end of March, is my
9 understanding, their updated seismic hazard
10 evaluations, right?

11 MS. KARAS: Yes. That's correct.

12 CHAIRMAN CORRADINI: Okay.

13 MEMBER RICCARDELLA: I'm working as hard
14 as I can to get up to speed on this, John.

15 MR. TAI: Okay?

16 CHAIRMAN CORRADINI: Okay.

17 MR. TAI: No more questions? Dr. Cook is
18 here to --

19 CHAIRMAN CORRADINI: So we move to the
20 joys of 106.

21 MR. TAI: 106, yes.

22 CHAIRMAN CORRADINI: Okay. Thank you.

23 (Off microphone comments)

24 MR. COOK: Good morning.

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1 CHAIRMAN CORRADINI: Good morning. And
2 you are?

3 MR. COOK: I am Christopher Cook. I'm
4 Chief of the Hydrology and Meteorology --

5 CHAIRMAN CORRADINI: Usually I've got
6 some sort of fancy tent for you.

7 MR. COOK: I was looking for my tent. And
8 I --

9 CHAIRMAN CORRADINI: So you're tentless.

10 MR. COOK: I'm tentless.

11 MEMBER STETKAR: You're well known. You
12 don't need a tent.

13 MR. COOK: I can scribble on the back of
14 one.

15 CHAIRMAN CORRADINI: All right.

16 MEMBER STETKAR: He needs no
17 introduction. Therefore, he got none.

18 CHAIRMAN CORRADINI: Dr. Cook, you're up.

19 MEMBER STETKAR: No tent for Dr. Cook.

20 MR. COOK: I'll see what I can do with
21 that. I'm here to close out and discuss Action Item
22 106, which was a takeaway that we had from --

23 CHAIRMAN CORRADINI: Don't worry. We
24 know you. Don't worry. Or was there? Here we go.

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1 Put it up there.

2 MR. COOK: To close out Action Item 106.
3 I'm Chief of the Hydrology and Meteorology Branch in
4 the Office of New Reactors. I also participated
5 actively in the development of the ISG, the Interim
6 Staff Guidance, that are associated with dam failure.
7 And so coming to you today.

8 And I have a few slides put together that
9 will hopefully close out and talk about this Action Item
10 that's remaining from last year here. Next slide.
11 Going back through my notes, it was sort of surprising
12 when I opened up to see when we came here for the STP
13 presentation.

14 It was almost exactly a year ago. So on
15 April the 23rd of 2013 we were here talking about STP
16 and the 2.4 hydrology review. And as a product of that
17 coming out, this Action Item, one of the things we were
18 talking about was this Interim Staff Guidance on dam
19 failure, that was in the works of going out.

20 In fact, it was, the draft was issued for
21 public comment on the 25th, only a couple of days later
22 after we had met, that it was getting ready to go out.
23 And I think one of things that this group was interested
24 in was sort of, you know, trying to understand how the

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1 lessons learned from this process were going through
2 And what I presented to you was
3 incorporated in this ISG, and what we had done. And
4 then also, I was going to mention sort of how we're using
5 this and applying it. Because it was developed -- As
6 you know, this is a JLD-ISG. So this is an Interim
7 Staff Guidance that was developed for the purposed of
8 performing the recommendation 2.1, flooding hazard
9 assessments there.

10 Okay. Next slide. So, in developing the
11 ISG, in addition of course to the information that we
12 had from the STP review that was going on, there were
13 several different groups who were also meeting with
14 this. First of all was the Interagency Committee on
15 Dam Safety.

16 This is a joint federal agency that's
17 there. All the agencies that own, operate or regulate
18 a dam are a party to this. When we told them that we
19 were looking at developing this Interim Staff Guidance,
20 back in October of 2012, so going back to October of
21 2012, they formed a special working group.

22 And we met several times to go over the
23 information that is contained in the ISG. And the
24 workgroup met several times. Because I think a key

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1 thing that we wanted to do is make sure that the ISG
2 that we put out not only incorporated lessons learned,
3 but also was consistent with federal guidance that was
4 there.

5 That was one of the key things we were
6 trying to do, is to make sure that our guidance that
7 we put out was consistent with other federal guidance.
8 In addition to that we had several public meetings that
9 were there. There was an NEI led task force that was
10 formed to look at these hazards as well, hazards from
11 dam failure.

12 We went with them separately to talk about
13 their comments on the ISG, and how things were
14 progressing. We also received numerous comments from
15 both working groups, and members of the public.

16 And the public comments that are in there
17 are all documented in a separate ML number that you see
18 there before you. So that goes through. And that's
19 a comment resolution that we received on the ISG that
20 was put together.

21 So the whole reason why I'm talking about
22 this is just to go over this short of breadth of review
23 that went into this ISG that was published in July of
24 2013. Okay. Next slide.

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1 So the ISG itself, it contains numerous
2 staff positions that are there. It allows for a high
3 level screening of dams, to identify ones that are
4 critical in the watershed, that could obviously, you
5 know, flood the site that would be there.

6 And then once you sort of identify which
7 dams are really of particular interest, you go through
8 a review where you review each one of those critical
9 dams against all potential failure modes that are
10 possible.

11 MR. HINZE: May I ask a question?

12 MR. COOK: Yes.

13 MR. HINZE: How do you get the critical
14 dams? Is this a back of the envelope type of --

15 CHAIRMAN CORRADINI: It's a back, very
16 high level screening. If you were to say transpose the
17 entire volume of water down the dam, any potential
18 whatever to flood the site.

19 MR. HINZE: So, you're not taking into
20 account any breach equations or anything like that?

21 MR. COOK: Not at that point, no. It's
22 really just sort of -- Some sites, obviously not for
23 -- Well, some sites, including STP, where it can be,
24 you know, there could be a number of sites that are

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1 upstream of it.

2 And in some watersheds there can be
3 hundreds, if literally not thousands. If you actually
4 go out, there's a national inventory of dams database
5 that's there, that's maintained by the Corps of
6 Engineers.

7 And if you put in some of the locations for
8 some of our fleet wide nuclear power plants, you can
9 see that there are large numbers. And so it's really
10 trying to winnow down that set to the ones that really
11 have even a remote potential to flood the site.

12 MR. HINZE: Well, you do a very good job
13 of coupling your processes. And do you do that at this
14 level, at this high level?

15 MR. COOK: It's, really at the very high
16 level it's really just a -- When you say coupling the
17 process --

18 MR. HINZE: Dam by dam?

19 MR. COOK: Dam by dam? We allow people to
20 sort of cluster and group the dams together, to sort
21 of say even an entire tributary. You can't really have
22 sort of an impact, yes.

23 MR. HINZE: Thank you.

24 MR. COOK: Yes. Any other questions?

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1 So, primarily there are three failure modes when we get
2 into a detailed example, hydrologic, sort of, you know,
3 overtopping, internal pressure, you know, when the
4 reservoir is full, seismic failure that's there and
5 then sunny-day

6 And I'll mention more about each one of
7 these groups of potential failures, failure modes that
8 are there. So, first of all, the hydrologic failure.
9 And these are quotes from the Interim Staff Guidance.
10 And you'll see at the bottom of the page I've put the
11 page reference.

12 If you guys don't have it, we certainly
13 have copies. But it's a rather big document. So I
14 pulled out the page numbers. So, just in case you're
15 interested in seeing where more of this information
16 came from, you can certainly see that reference.

17 But for hydrologic failure, this is fairly
18 standard. And, you know, you've seen the reviews that
19 we've been doing, where we're saying that, you know,
20 the dam should be assumed to fail if it can't withstand
21 its basin specific probable maximum flood.

22 In addition to, you know, just looking at
23 whether it can withstand it from overtopping, we're
24 also talking about, you know, as I mentioned before

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1 internal pressure. So it's just the very high head
2 that's there behind the dam building up internally,
3 especially if you've an earthen dam there. Just making
4 sure it can withstand it.

5 We're also looking at the potential for
6 spillway failures, for gate failures, for operational
7 failures. So all those things sort of are combined
8 together and looked at in the hydrologic failure
9 mechanism. Seismic failure, this particular one some
10 of the updating that we did getting here was to go more
11 probabilistic in terms of the annual exceedance period
12 that was there.

13 This stems from guidance from ANS, ANSI 2.8
14 that we have. And there they were targeting the SSE
15 and the OBE that was taking place. And there was a
16 combination of floods with these different ground
17 motion levels. And we kept with this. In large part
18 this is, I realize it's highly stylized.

19 But the reasons for doing that were because
20 our existing guidance was sort of written this way. We
21 wanted to go certainly probabilistic with looking at
22 the ground motion levels to bring it up to present day.
23 But there was a large number of industry that really
24 wanted to keep the floods associated with it. Again,

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1 for the JLD-ISG.

2 MEMBER STETKAR: Chris --

3 MR. COOK: Yes.

4 MEMBER STETKAR: You know, I understand
5 the pragmatism. These are pretty doggone arbitrary.
6 You're asking everybody to re-characterize their site
7 specific hazard. We had that discussion here. Why
8 doesn't somebody look at the dam with the site specific
9 hazard?

10 Why have this arbitrary ten to the minus
11 four, with the 25 year flood, half the ten to the minus
12 four ground motion with a 500? I mean, that's just
13 arbitrary.

14 MR. COOK: Sure, sure. No. And it was
15 saying it was there that was, we agreed with the
16 purposes. You know, as I mentioned, there were these
17 different working groups that were together.

18 And there was agreement with this for this
19 particular Interim Staff Guidance that was there to do
20 that. Now, we're also in the process of updating Reg.
21 Guide 1.59. I believe we come to you separately to talk
22 about that updating. That is still going on.

23 And I, not to foreshadow where we will be
24 going in the future, but I anticipate that that question

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1 exactly is being revisited and looked at. This was
2 really done for the purposes of 2.1, to move forward
3 for that particular review.

4 CHAIRMAN CORRADINI: I don't, you guys are
5 talking since you have -- I remember I missed the
6 subcommittee meeting. So I'm more uncertain about
7 that answer. I don't understand that answer relative
8 to his question.

9 So, why isn't it not just linking whatever
10 they have to do on that site to the facilities near the
11 site? Is it just, is it that the models to that are
12 too uncertain?

13 MR. COOK: No. No, no, no. It's just
14 that when you're looking at the potential for a seismic
15 failure of the dam, and you're looking at the capacity
16 of the dam, versus the demand that you're going to have.
17 So you have some sort of a demand that you're putting
18 with it.

19 You have to assume some sort of a water
20 level behind that reservoir at that particular time.
21 And what Dr. Stetkar was just asking is, well, why do
22 you assume a 25 year flood level for that kind of ground
23 motion.

24 MEMBER STETKAR: I'm asking two things.

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1 The 25 year flood and the 500 year flood --

2 MR. COOK: Sure.

3 MEMBER STETKAR: -- are kind of arbitrary
4 ways to get the water level up.

5 MR. COOK: Yes.

6 MEMBER STETKAR: Which are arbitrary.
7 Because you wouldn't necessarily expect a 25 flood or
8 a 500 year flood to be coincident with these
9 earthquakes. So in some sense that's an element of
10 conservatism.

11 On the other hand, for the plant, the SSCs
12 in the plant, people evaluate a HCLPF capacity relative
13 to the current seismic hazard. High confidence, low
14 probability of failure --

15 MR. COOK: Right.

16 MEMBER STETKAR: -- for the margins
17 analysis. And they go through that estimate.

18 MR. COOK: Right.

19 MEMBER STETKAR: One can do the same type
20 of estimate for a dam, whether it's a concrete dam, I
21 mean, people do that.

22 MR. COOK: Oh, sure, sure.

23 MR. COOK: There might be uncertainties.

24 Why not request the applicant, the licensees or the

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1 applicants to a comparable assessment for their dams,
2 based on their site specific seismic hazard? Without,
3 you know, some uncertainty in water level you can take
4 the nominal, you know, water level in the --

5 MR. COOK: Right. There are multiple
6 challenges, you know, with -- Certainly the technology
7 is there to be able to do that. I mean, there would
8 be multiple challenges. Now remember, this is far
9 removed from STP when we're talking about --

10 MEMBER STETKAR: That's right. And I
11 think we have --

12 (Crosstalk)

13 MR. COOK: I want to answer your question
14 though. And maybe we can do that off line.

15 MEMBER STETKAR: Yes.

16 MR. COOK: What we would do, particularly
17 I'm thinking of a licensee where you have a federally
18 owned dam, where they don't have all that information.
19 Nor are they able to ask the federal agency to do that
20 particular review in a timely fashion.

21 MEMBER STETKAR: They can come to you, and
22 you can ask though.

23 MR. COOK: Well in fact --

24 MEMBER STETKAR: We had some discussions

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1 about this.

2 MR. COOK: Yes, exactly. And you'll see
3 that language foreshadowing that this was coming, that
4 we put in the ISG.

5 CHAIRMAN CORRADINI: But I think to bring
6 it back to STP. And then, in some sense this is a
7 generic discussion --

8 MR. COOK: Yes.

9 CHAIRMAN CORRADINI: -- that helps us
10 remember. But to bring it back to STP. I think the
11 reason this was brought up and is historically there
12 is that one of our members was confused as to why the
13 applicant was being asked to do all these various and
14 sundry analyses. Was it really this uncertain? I
15 think that was the source of the original question.

16 MR. COOK: Right. And what I was --

17 CHAIRMAN CORRADINI: Right? I'm looking
18 at my --

19 MR. COOK: Sure.

20 CHAIRMAN CORRADINI: -- DFO, to make sure
21 I've got it right. But I think that was the source of
22 it.

23 MS. BANERJEE: Uncertainty involving the
24 analysis that were used for the main cooling reservoir

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1 failure.

2 MR. COOK: Exactly. And I'm going to skip
3 forward and talk to that. But that particular one is
4 Slide 8.

5 CHAIRMAN CORRADINI: Okay. That's fine.

6 MR. COOK: So Slide answers getting back
7 in. I just sort of wanted to give a high level --

8 MR. COOK: No, no, that's fine.

9 MR. COOK: -- view of what the ISG have in
10 it.

11 MEMBER STETKAR: You left yourself open.

12 MR. COOK: Well it was -- But I mean, it
13 was -- I working with Maitri, this was sort of the
14 presentation I guess you all had wanted to have. So
15 I was trying to also meet the need as well.

16 CHAIRMAN CORRADINI: No. We need to
17 learn. He knows everything. We need to learn.

18 MR. COOK: Okay. So continuing on, if
19 we're done with seismic, getting into sunny-day failure
20 that's there, which is Slide 6. This is the failure
21 method that we were looking at with STP, you know,
22 because we had already said it was precluded from
23 failure looking at it with what we have from hydrology.

24 We also looked at its capacity that was

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1 there and said it was probably not going to fail
2 seismically. So the sunny-day failure was really the
3 failure mechanism that we were looking at for the STP
4 scenario that was there, looking at it, you know, the
5 piping failure that would result.

6 And this is some language again from the
7 ISG that talks about this. Because it just sort of gets
8 that to that unknown factor with large, you know,
9 structures that are there, such as with dams, and the
10 technical opinion of the larger federal community.

11 And so this was a statement that we had in
12 there. But again, this is really from that interagency
13 committee on dam failure, where we're looking at it,
14 and just really saying that failure rates when you start
15 talking about things on the order of, you know, one
16 times ten the sixth, realizing that that's not
17 necessarily a target.

18 But when you start moving out to that
19 level, really beyond ten to the minus four, ten to the
20 minus five, in that area, you get into an area where
21 you just should assume a failure and look at it. And
22 this is actually standard practice for other federal
23 agencies.

24 Of course, their purview is not regulating

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1 and looking at nuclear power plants. But as far as
2 emergency, you know evacuation plans for communities
3 and other such things, they just assume that there's
4 a failure. And then they do emergency action plans to
5 prepare for that and do it.

6 So this is sort of a broader opinion for
7 the type of community. And that's actually what we did
8 for STP as well. So federal dams. And this gets back
9 to what, you know, Dr. Stetkar was talking about.

10 What we did is, we had some language that
11 was in here, realizing that privately owned, you know,
12 utilities trying to engage other agencies of the
13 Federal Government would probably best be done by
14 working through us.

15 And so we had this statement in there that
16 if a licensee goes through and looks at the portfolio
17 of dams that are upstream of their site, what they
18 should do is, when they go through that screening that
19 I mentioned before, if they notice that a federally
20 owned, operated or regulated dam is critical. Again,
21 going back to that language where it could inundate the
22 site.

23 Come see us. Come see the NRC. And then
24 we will work with the other federal agencies. You

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1 know, one of the things with federal dams, we were just
2 talking about emergency action plans. Both the
3 schematics of dams, the technical drawings, the
4 technical information on federal dams, as well as the
5 downstream inundation height information is security
6 related information.

7 So that is something that we would consider
8 to be a SUNSI. And that is protected. It's FOUO by
9 other federal agencies. But we call it SUNSI. And so
10 that's sensitive security related information. And so
11 that's why this sort of agreement was necessary for them
12 to have. Because many of our licensees, you know, many
13 of the federal agencies requested it, to be quite
14 honest.

15 Okay. So the second bullet is just saying
16 they should do this. And the licensees, and the reason
17 why I have this written as licensees and not applicants
18 is because again, we were doing this for the 2.1
19 reviews. Obviously, if this gets incorporated into
20 our guidance going forward for new reactors, we'd be
21 talking about applicants as well. But they should be
22 doing this promptly when they get through any of the
23 screening.

24 Okay, next slide. So this really gets at,

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1 Dr. Corradini, your question. You were looking at STP
2 and the breach uncertainties. And at that ACRS meeting
3 that was there almost a year ago, there was a lot of
4 discussion.

5 Several presentations that were there,
6 approximately four hours worth of discussions dealing
7 with the uncertainties that were there, the
8 inconsistencies that were there. And really a lot of
9 the outcomes and the lesson learned from a lot of that,
10 if you go back and going through it is, there was a lot
11 of question about relying on one particular method.

12 You know, there are multiple different
13 formulations. There are multiple technical journal
14 articles out there about a particular, you know, about
15 different breach regression equations. And some of
16 them, some published some things on them. Other people
17 have published other things on them. They were
18 developed on certain catalogues of dam information,
19 certain dam failures that were there.

20 And so really, the thing that came out of
21 that, I think the biggest lesson learned was not to rely
22 on one particular formulation. What you really want
23 to do is, you want to look at multiple different
24 formulations that are out there, compare the results

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1 together, look at them to see how they vary.

2 And then go through and judge, and provide
3 a justification as to why you, you know, selected that
4 particular regression equation that was there, as well
5 as the value that results that come out of it, and the
6 conservatisms that were taken as you went through those
7 calculations.

8 And really, what we wanted to make sure
9 that we had, especially in the 2.1 reviews was that
10 documentation, that description of the justification
11 as to why they did it. And then also explicitly talking
12 about the parameter uncertainty and the range of
13 values, and the results that came out, to help
14 understand them when you put them into context.

15 CHAIRMAN CORRADINI: So, if I were to day
16 it differently.

17 MR. COOK: Sure.

18 CHAIRMAN CORRADINI: To take us back a
19 year --

20 MR. COOK: Yes.

21 CHAIRMAN CORRADINI: Where we came out of
22 this is, there was no problem necessarily with South
23 Texas. We were just trying to understand why they were
24 put through so many paces simultaneously. And the

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1 answer is, given -- Now, this is my interpretation of
2 what you just said.

3 Given the low probability of the event, and
4 how big of an effect it is, you wanted to look at a range
5 of models, to make sure that however, whatever model
6 you picked, things looked okay. That's what I heard
7 you say.

8 MR. COOK: And in essence, you'll see that
9 in staff's SER, where they talked about the different
10 regression equations. You'll talk about the different
11 ways they went about it. You'll talk about the
12 different values that came out.

13 And ultimately the justification is then
14 written in the SER as to why this was selected, why it
15 was okay. And then also why we felt like it was the
16 value that the, you know, applicant selected was fine,
17 and we felt that we had reasonable assurance of safety.

18 CHAIRMAN CORRADINI: Okay. But I was
19 close. Good.

20 MR. COOK: Yes, no, you were.

21 CHAIRMAN CORRADINI: Okay.

22 MR. COOK: Probably just should have said
23 yes.

24 CHAIRMAN CORRADINI: That's okay. I'm

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1 happy with this. Any members of the subcommittee want
2 to ask additional questions? No?

3 MS. BANERJEE: Yes.

4 MR. HINZE: Well, let me ask one question
5 if I may? Are you promoting any research into trying
6 to developing a more unified theory of breaching, and
7 the related problems?

8 MR. COOK: We have looked forward. And
9 we're actively working with your Office of Research to
10 look, you know, at dam failure. I mean, if you look
11 at the hazards I think that could potentially impact
12 fleet wide nuclear power plants that are in there,
13 certainly there are a number of sites throughout the
14 fleet that are susceptible should an upstream dam fail.

15 And so it's certainly one that, you know,
16 my branch is looking at. And always trying to figure
17 out methods to improve the state of the science. And
18 in fact, we're actually even doing it with a lot of our,
19 you know, reviews as we're doing with the 2.1
20 recommendation.

21 You know, we're reaching out, you know, to
22 experts, like we were with STP actually, you know, to
23 get their opinions, as well as look at the
24 justification, you know, to understand sort of the

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1 values that come out. As far as a unified theory for
2 say, you know, one equation that matches all, it's very
3 hard to I think --

4 MR. HINZE: Parameterize.

5 MR. COOK: Yes, exactly. And given the
6 rarity of large dams failing, given, you know, the
7 rarity of even sort dams that are very well constructed,
8 they're a very uncommon event. However, they do occur.
9 So we need to, you know, progress, and again, look at
10 the data catalogues that are there, and advance as much
11 as we can.

12 MR. HINZE: We have all these regression
13 equations --

14 MR. COOK: Yes.

15 MR. HINZE: -- and ideas to bring that
16 uncertainty down, by bringing them closer together.
17 And if we can try to relate the parameters of the dam
18 and the event to the results, we'd be, we could decrease
19 that uncertainty.

20 MR. COOK: Right. I mean, and, you know,
21 there are also other classes of models that are out
22 there too that also exist, you know, beyond regression
23 equations. But the NRC got into the physically based
24 models, where you're actually looking at the structure.

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1 MR. HINZE: Yes.

2 MR. COOK: You know, when you have that
3 type of failure introduced, and you have it physically
4 going through. So you have the structural models of
5 that as you go forward. And there are those. It's
6 another class of model. It wasn't what was done for
7 STP. But those also exist.

8 So, I mean, I hope I think where the, you
9 know, this is my technical area, where I think this
10 technical area's going to go in the future. But I think
11 that, you know, having it right now, I can't point to
12 anything. But we're certainly trying to promote it.

13 MR. HINZE: But the level of knowledge on
14 this certainly looks like it could be enhanced, and
15 improve your predictions.

16 MR. COOK: Exactly. And there is still a
17 lot of, I'll grant you that. There is a lot of
18 technical expert judgment that comes into looking at
19 these, and what are reasonable when you look at it.

20 CHAIRMAN CORRADINI: So to put Bill's
21 question more directly. Is there a user need that
22 you've expressed to research that they'll act on? In
23 the terms of the connection between NRO and NRR and RES?

24 MR. COOK: We have a larger enveloping

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1 research plan.

2 CHAIRMAN CORRADINI: Oh, do you? Okay.

3 MR. COOK: Yes. And so that research plan
4 is being developed right now. It's something that was
5 talked about at the January 6th Commission meeting that
6 was there.

7 CHAIRMAN CORRADINI: Okay.

8 MR. COOK: Bill Ott, Dr. Bill Ott was there
9 to talk about it. I know that we're ongoing with it.
10 We're actually meeting this Friday to talk about
11 another draft of it that's there.

12 CHAIRMAN CORRADINI: Okay.

13 MR. COOK: But dam failures is one of the
14 components in that research plan, yes.

15 CHAIRMAN CORRADINI: Maitri, you had a
16 question.

17 MS. BANERJEE: Yes. I just wanted to ask
18 the members. We discussed three Action Items, 96 and
19 97, resulting from Professor Hinze's questions, and
20 this Number 106. So the members all decide we can close
21 them now, or not?

22 CHAIRMAN CORRADINI: Let's finish today.
23 But my feeling is yes. But we'll go around the table.

24 MS. BANERJEE: Okay.

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1 CHAIRMAN CORRADINI: Just to make sure.

2 MS. BANERJEE: Thank you.

3 CHAIRMAN CORRADINI: Any questions though
4 for Dr. Cook? You look like you're free.

5 MR. COOK: Great.

6 CHAIRMAN CORRADINI: Escape while you
7 can.

8 MR. COOK: Thank you for that. All right.

9 CHAIRMAN CORRADINI: Okay. Before we go
10 around the table, I want to ask to get the phone line
11 opened up to see if there's public comment. I'll look
12 behind me to see anybody wants to make a comment in the
13 room. Hearing nobody racing to the mic, I think the
14 answer is no.

15 So can we open up the phone line to see if
16 somebody's out there that wants to make a comment? And
17 if anybody's out there, could you kind of cough, or make
18 a noise, so we know you're --

19 MEMBER STETKAR: It's not open.

20 (Off microphone comments)

21 CHAIRMAN CORRADINI: It's open.

22 MS. BANERJEE: The line is open.

23 CHAIRMAN CORRADINI: Okay. Anybody out
24 there? Okay. Let's close the line since nobody's out

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1 there. And let's go around the table. I'll start on
2 the left. Pete, can you kind of give me your thoughts
3 of today?

4 And then, in particular, just to remind you
5 all, we purposely structured today, besides 2.5, to
6 kind of discuss the open items from previous times. So
7 if you have any issues about those too. Pete?

8 MEMBER RICCARDELLA: No. I think other
9 than the question that John raised about the
10 variability in the seismic curves, I don't see any
11 issues. And I think that's more of a generic issue,
12 not a STP site specific issue.

13 CHAIRMAN CORRADINI: Okay. Bill?

14 MR. HINZE: Well, I think the applicant
15 and the staff has done a very good job on this. I
16 reviewed their reports very carefully. And I think
17 they've done an excellent job.

18 As far as the open items, I think that
19 perhaps we've sensitized the staff to the need for
20 really being very careful about those growth faults and
21 the mapping of them.

22 But I think we're ready to close that down.
23 I think that in terms of the CEUS, it was a natural
24 progression to the response to the Fukushima Near-Term

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1 requirements. So I think we're in clear shape on both
2 of those open items.

3 CHAIRMAN CORRADINI: Okay.

4 MEMBER BLEY: Nothing to add.

5 MEMBER STETKAR: I don't have anything
6 additional to add as far as, you know the Action Items.

7 CHAIRMAN CORRADINI: Okay.

8 MEMBER STETKAR: I agree those are --

9 CHAIRMAN CORRADINI: Okay. Thank you,
10 sir.

11 MEMBER STETKAR: You're welcome, sir.

12 CHAIRMAN CORRADINI: Dr. Ryan?

13 MEMBER RYAN: I just want to add my
14 appreciation. The staff and the applicant have done
15 a very good job, I think, of coordinating their reviews.
16 And it's clear they've done a lot of work to bring it
17 to one story, and understand it, you know, all around.
18 So, congratulations.

19 CHAIRMAN CORRADINI: Charlie?

20 MEMBER BROWN: No.

21 CHAIRMAN CORRADINI: Ron?

22 MEMBER BALLINGER: No.

23 CHAIRMAN CORRADINI: Okay. So from my
24 perspective I wanted to thank STP, NINA, I'm sorry, I

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1 keep on saying STP, NINA for their presentations. And
2 actually trying to go back and reconstruct some of what
3 we were asking of them relative to the open items for
4 the 2.5. And also thank the staff.

5 So, from my standpoint, I think the only
6 thing that we need clarification on is the methodology
7 that NINA used to generate their, and I'll give the
8 wrong plot, but essentially their GMRS relative to the
9 expectation that the uncertainty would broaden with
10 frequency and acceleration. And they don't appear to
11 be.

12 And then generally, or more generically,
13 the staff is going to go back for NUREG-2115, and try
14 to explain to us how those were generated. So we're
15 in understanding as to why they are what they are.
16 Other than that, I think all the previous open items
17 have been closed.

18 I will remind the members that we sent out
19 an internal memo, since having inherited this. I
20 wanted to at least get everybody on the same page as
21 to the history here. Because we go back essentially
22 five years in all of this activity. And so I put a memo
23 out to you all, just so you have it.

24 And these last three that we discussed,

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1 relative to 96 on the growth faults, 97 on the
2 seismicity, and 106 on the dam failures, were just the
3 last set of those that we wanted to make sure we're up
4 to speed. Other than that, I want to check with Maitri
5 and Scott. We have a planned meeting in September --

6 MS. BANERJEE: On the third.

7 CHAIRMAN CORRADINI: -- which is the first
8 week of September, right, just before the full
9 committee meeting, where we'll take up the last
10 Fukushima, right?

11 MR. HEAD: I believe so.

12 MS. BANERJEE: Fukushima 4.2, mitigating
13 strategies.

14 MR. HEAD: Right. That will be
15 mitigating strategies.

16 MS. BANERJEE: Yes.

17 MR. HEAD: We'll focus on that.

18 MS. BANERJEE: That's September 3rd.

19 CHAIRMAN CORRADINI: And other than that,
20 are there any other comments by anybody?. Thanks to
21 all. Thanks to NINA. Thanks to the staff. And we're
22 adjourned. Enjoy your lunch.

23 (Whereupon, the meeting in the
24 above-entitled matter was adjourned at 11:37 a.m.)

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South Texas Project Units 3 & 4

Presentation to ACRS ABWR Subcommittee:

Chapter 2, Section 2.5:

Geology, Seismology, and Geotechnical Engineering

Chapter 1, Appendix 1E:

Response to NRC Post-Fukushima Recommendations



Agenda

- License Condition 2.5.1-1: Geo Mapping Open Excavations
- Open Item 2.5.4-37: ITACC for Backfill and Shear Wave Velocity
- Central and Eastern United States (CEUS)
Seismic Source Characterization (SSC)
- Spent Fuel Pool (SFP) Instrumentation (7.1)
- Enhanced Emergency Plan Staffing and Communication (9.3)

Attendees

Scott Head	Manager, Regulatory Affairs, NINA
Dick Bense	Engineer, Regulatory Affairs, NINA
Dick Scheide	Regulatory Affairs, NINA
Brian McDonald	Exponent Engineering and Scientific Consulting
Joe Litehiser	Bechtel Power Corporation

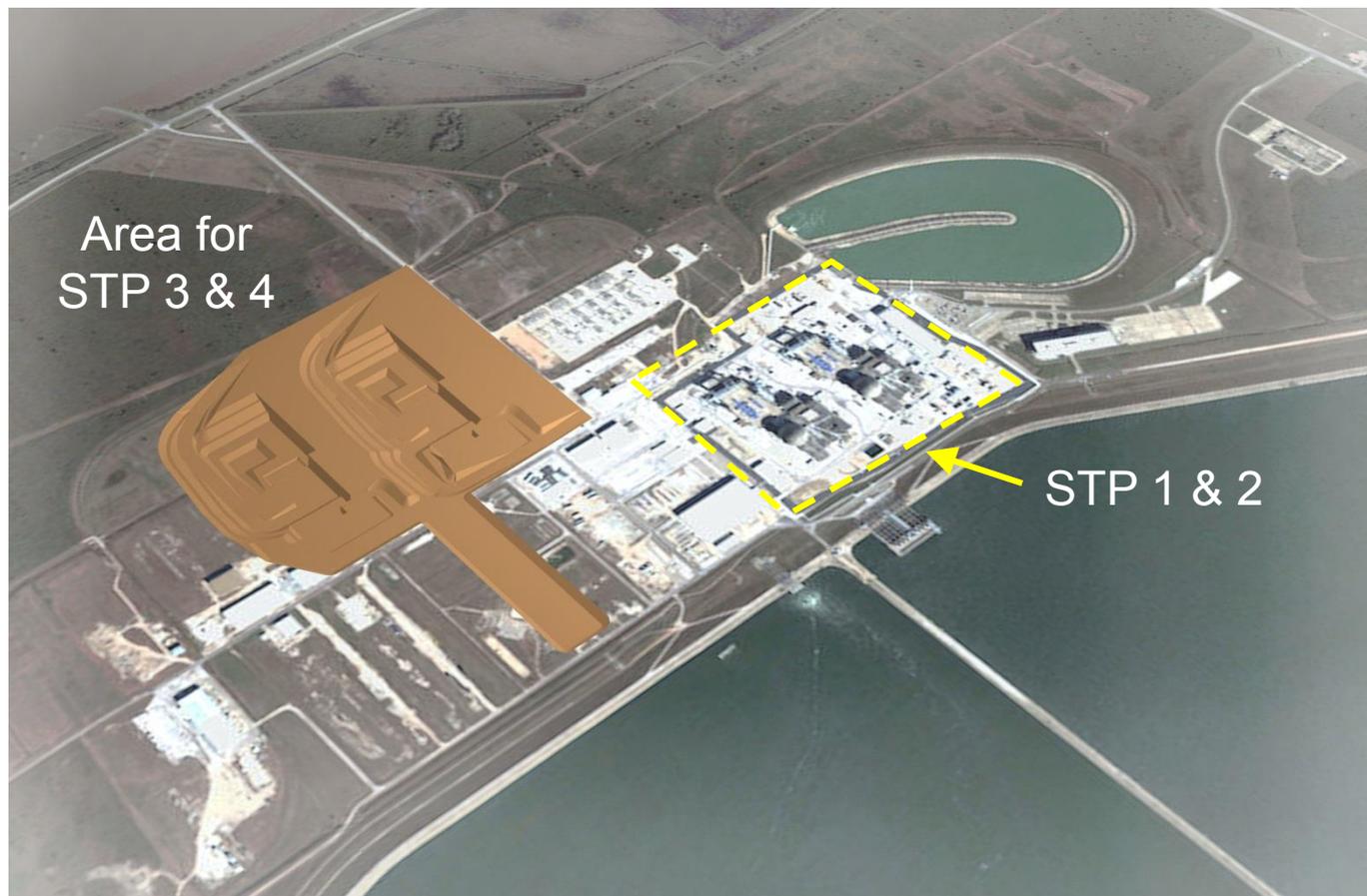
Chapter 2 – Site Description

South Texas Project Site:



Chapter 2 – Site Description (Continued)

Site layout showing Main Cooling Reservoir (MCR) and
Location of STP Units 1 & 2 and STP Units 3 & 4



License Condition 2.5.1-1:

Geologic Mapping of Open Excavations

NRC Staff proposed the following License Condition:

The Licensee shall perform detailed geologic mapping of the excavations for the STP Units 3 and 4 nuclear island structures; examine and evaluate geologic features discovered in excavations for safety-related structures other than those for the Units 3 and 4 nuclear islands; and notify the Director of the Office of New Reactors, or the Director's designee, once excavations for STP Units 3 and 4 safety-related structures are open for examination by the NRC.

Open Item 2.5.4-37:

ITACC for Backfill and Shear Wave Velocity

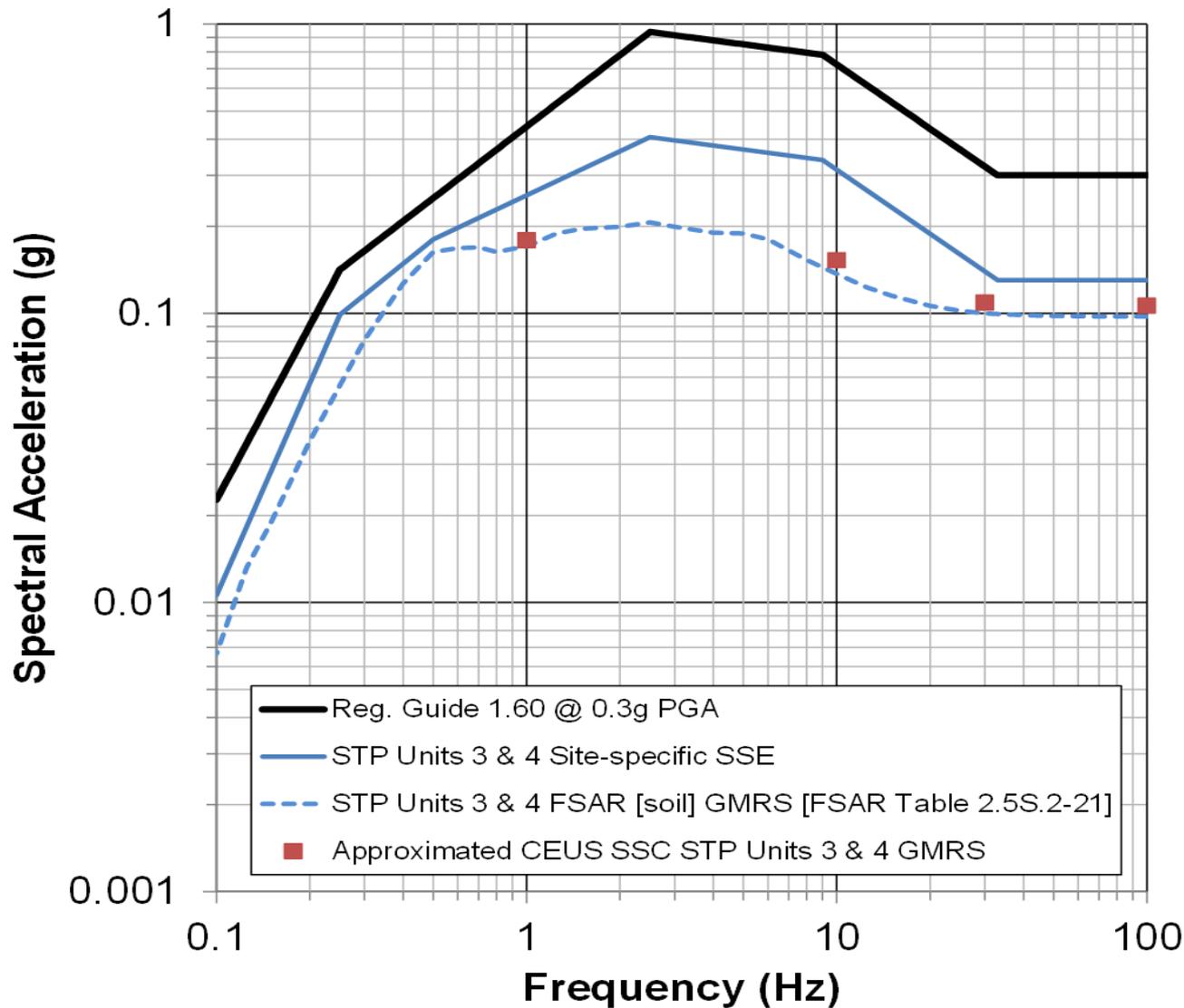
COLA Part 9, Inspections, Tests, Analyses, Acceptance Criteria, Table 3.0-11, Backfill Under Seismic Category I Structures, establishes three ITAAC for Backfill:

1. Backfill under Category 1 structures is installed to meet a minimum of 95 percent of the Modified Proctor density.
2. The shear wave velocity of backfill under Seismic Category I structures meets the value used in the site-specific design analyses.
3. The engineering properties of backfill to be used under Seismic Category I structures bound the values used in the site-specific design analyses.

Fukushima Recommendation 2.1

- Ground Motion Response Spectrum (GMRS) and Probabilistic Seismic Hazards Analysis (PSHA) for STP 3 & 4 completed in 2010.
- STP 3 & 4 GMRS and PSHA based on the updated maximum magnitude distribution for STP Site using EPRI sources in a SSHAC Level II approach as defined in NUREG 6372, “Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts”
- NUREG-2115, issued in December 2011.
- STP concluded the CEUS SSC had minimum impact on STP GMRS and the design basis SSE was conservative.
- Conclusions not changed when CEUS Ground Motion Model (GMM) updated 2013.

Fukushima Recommendation 2.1 (continued)



Chapter 2, Section 2.5: Geology, Seismology, and Geotechnical Engineering

Questions and Comments



Chapter 1, Appendix 1E, Recommendation 7.1

1E.2.6 Spent Fuel Pool (SFP) Instrumentation (7.1)

- STP 3&4 design includes reliable level and temperature monitors
 - Level and temperature Indication with annunciation provided in Main Control Room via process computer
 - Level indication independent of process computer provided at Remote Shutdown System panel or other suitable location
 - SFP level instrumentation provides reliable indication:
 - Two permanent fixed instrument channels
 - Channels separated to provide reasonable protection from missiles
 - Indication from top of fuel racks to above normal operating level
 - Instruments powered by 1E batteries

Chapter 1, Appendix 1E, Recommendation 7.1 (continued)

- SFP level instrumentation enhancements are consistent with guidance provided in:
 - NEI 12-02, Revision 1, Industry Guidance for Compliance with NRC Order EA-12-051, to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, August 2012
 - JLD-ISG-2012-03, Compliance with Order EA-12-051, “Reliable Spent Fuel Pool Instrumentation”
- ITAAC exists requiring verification that SFP Level Instrumentation is installed properly and meets all design features as discussed in 1E.2.6

Chapter 1, Appendix 1E, Recommendation 7.1

Questions and Comments



Chapter 1, Appendix 1E, Recommendation 9.3

1E.2.8 Enhanced Emergency Plan Staffing and Communication (9.3)

- STP 3 & 4 Emergency Plan (EP) will be part of a site wide plan for Units 1 through 4
- NEI 12-01 “Guidelines for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities” will be used in assessing staff and communications capabilities necessary to a multi-unit beyond design basis event

Chapter 1, Appendix 1E, Recommendation 9.3 (continued)

- Results of the assessment will be addressed in the detailed EP procedures to be developed during implementation of Operational Programs (FSAR Section 13.4S) and in concert with STP 1 & 2
- ITAAC exists requiring verification that the assessment has been performed and that identified corrective actions have been incorporated into the Emergency Plan

Chapter 1, Appendix 1E, Recommendation 9.3

Questions and Comments





United States Nuclear Regulatory Commission

Protecting People and the Environment

Presentation to the ACRS Subcommittee

**South Texas Project Units 3 and 4
COL Application Review**

**SER with no OIs Chapter 2.5
“Geology, Seismology, and Geotechnical Engineering”**

April 9, 2014

Background

- ACRS Interaction for STP COL for Chapter 2
 - Previous Subcommittee briefings
 - Phase 4 SER w/no OIs
 - Sections 2.1-2.2 – June 2011, resulted in no ACRS action items
 - Sections 2.3- 2.4 - April 2013, resulted in 1 ACRS action item (106)
 - Phase 2 SER w/ OIs
 - Section 2.5 – November 2010, Comments from ACRS received after meeting which resulted in 2 ACRS action items (96 and 97)
- Focus of today's presentation
 - SER with no OIs Chapter 2.5 - Geology, Seismology, and Geotechnical Engineering

Staff Review Team – 2.5

- Technical Staff
 - Geosciences and Geotechnical Engineering Branch (RGS)
 - Rebecca Karas and Diane Jackson, Branch Chiefs
 - Laurel Bauer, Geologist
 - Yong Li, Senior Geophysicist
 - Sarah Tabatabai, Geophysicist
 - Frankie Vega, Geotechnical Engineer

- Project Managers
 - Tekia Govan
 - Tom Tai

Summary of Staff Review

- NO OIs associated with the 2.5.1, 2.5.2, 2.5.3, and 2.5.5.
- 2 OIs (settlement, shear wave velocity and backfill density) already resolved and discussed in the 11/30/2010 ACRS meeting.
- 2.5.1 License Condition - Geologic Mapping
- ACRS Action Item #96: Concern of growth faults at STP site
- 2.5.4-37 OI – Backfill ITAAC related to confirmation of engineering properties.
- ACRS Action Item #97: EPRI-SOG model - Fukushima NTTF Recommendation 2.1 Seismic Hazard Reevaluation (Chapter 22.1)

Section 2.5.1
Basic Geologic
and Seismic Information

License Condition 2.5.1-1

- Regulatory Guides 1.132 and 1.208 provide the guidance for conducting detailed geologic mapping of construction excavations for safety-related structures and other excavations important to the verification of subsurface conditions.
- Detailed mapping of the excavation surfaces ensures that no features indicative of capable tectonic structures or geologic features that may pose a hazard to the site are identified.

License Condition 2.5.1-1 (continued)

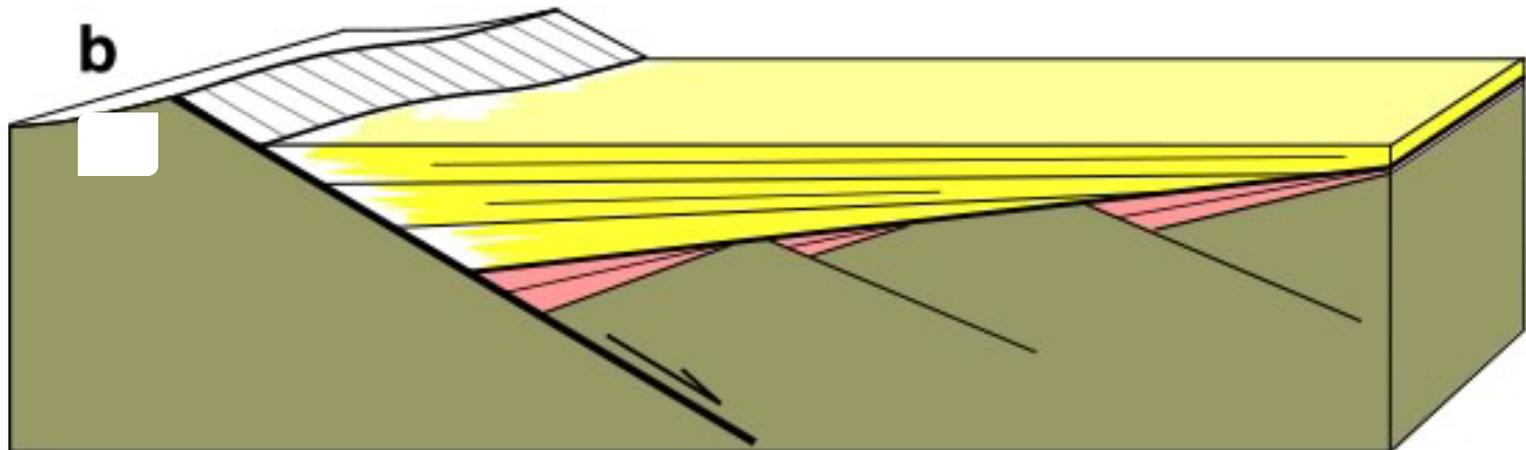
- The applicant must perform geologic mapping of future excavations for safety-related structures; evaluate any geologic features discovered in the excavations; and notify the NRC once excavations for safety-related structures are open for examination by the NRC staff.
- The applicant updated revision 4 of the STP COL FSAR. The applicant provided a description of its plans for geologic mapping during safety related excavations.

Concerns Related to Growth Fault at STP site

- **ACRS Action Item #96:** Would high-resolution shallow zone seismic reflection profiling using appropriate apertures, detail and best available techniques provide useful information on the presence and nature of growth faults in the STP 3 & 4 construction zone and in the vicinity of growth fault GMO and the nearby GMP fault in the southwest corner of the main cooling reservoir?

Growth Fault Definition

- A growth fault is a type of normal fault that forms during sedimentation and typically has thicker strata on the downthrown hanging wall than the footwall.



Growth Fault Characteristics

- Gravity-driven geologic features
- Resulting from abundant sedimentary deposition
- Usually non-seismic
- Poor continuation
- Slow moving

Detection of a Growth Fault

- Many methods to detect a growth fault
 - shallow seismic reflection
 - boring logs
 - LIDAR and leveling
 - or combination of all above

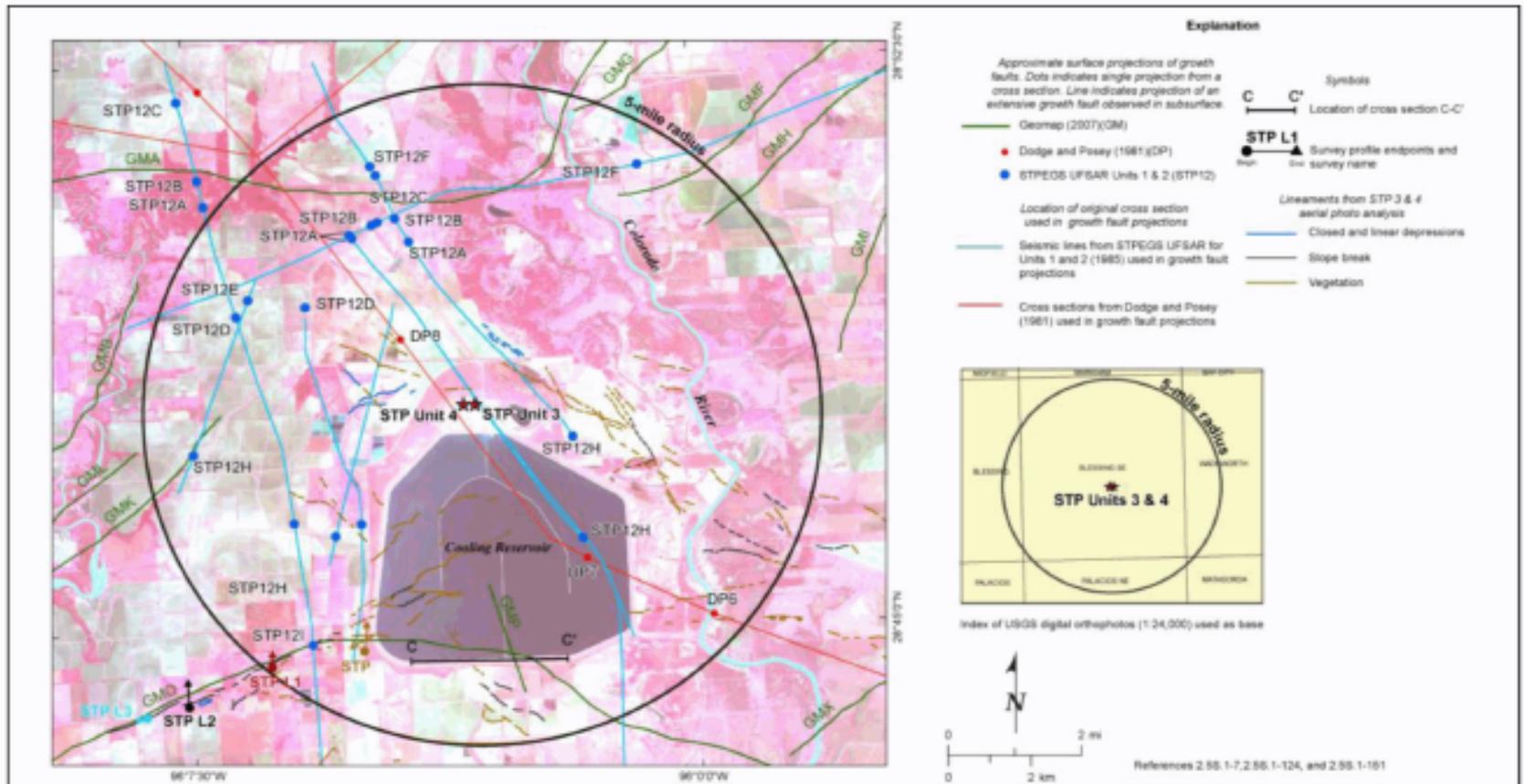
Methods Used in STP COLA and Outcome

- Based on Units 1 and 2 studies, the applicant evaluated recent growth fault studies in the area and used data from boreholes, aerial and field reconnaissance, geodetic survey to characterize these faults. But no new shallow seismic reflection lines were deployed
 - Even the latest shallow reflection method still provides relatively poor resolution at near surface
 - Growth fault related surface deformations were detected near the main cooling reservoir (MCR)
 - Presence of growth faults near MCR evaluated by applicant and NRC staff

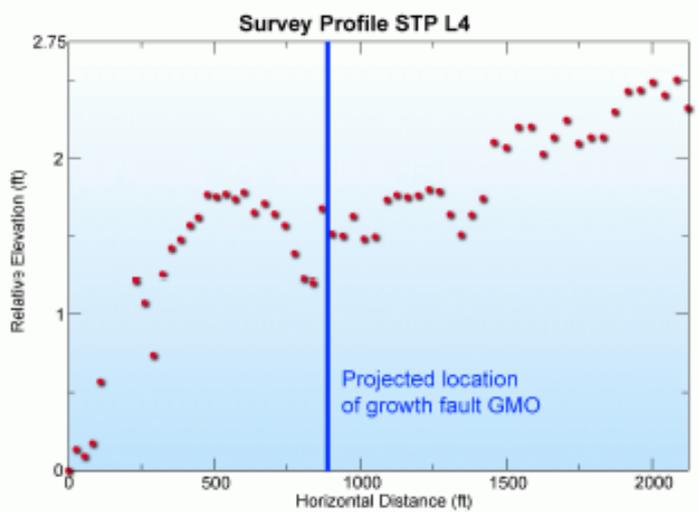
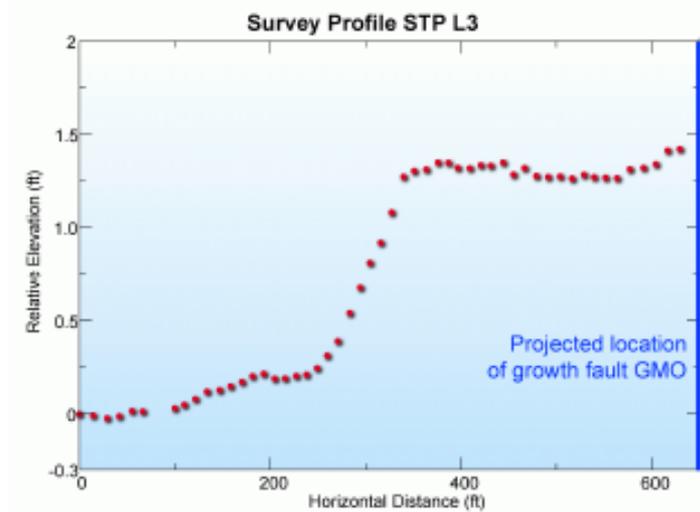
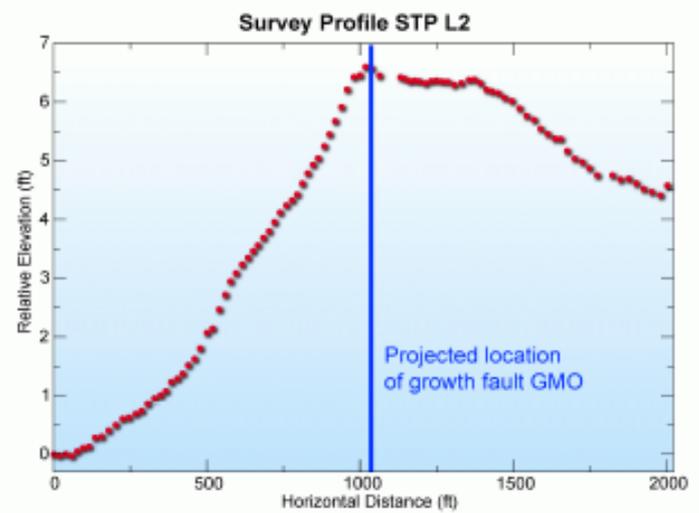
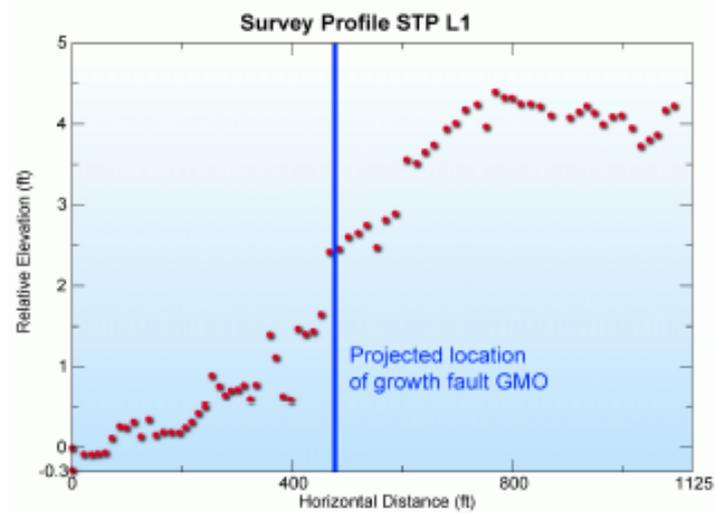
FSAR Conclusion on Growth Faults

- “There is *prima facie* evidence for localized, low relief tilting of the upper surface of the Beaumont Formation above growth fault Matagorda GMO/STP12I, just within the site area (5 miles radius) yet outside the site (0.6 mile radius). The deformation is characterized by south-down monoclinal flexure of the land surface, and is distributed across horizontal distances of 180 to 500 ft.”
 - Beaumont Formation is about 0.1 to 1 million years old

Growth Fault near STP site



Surface Deformation



For Safety Related SSCs

- Boring indicates subsurface stratigraphic continuity for the entire site.
- Units 1 and 2 foundation excavation detected no growth faults
- Since Units 1 and 2 construction, no observation of any abnormal topographic changes at the site
- Surface infrastructures associated with Units 1 and 2 indicate no recent surface deformation
- Embankment for the MCR indicates no surface deformation

Stratigraphic Profile (a-a¹) Location at Site

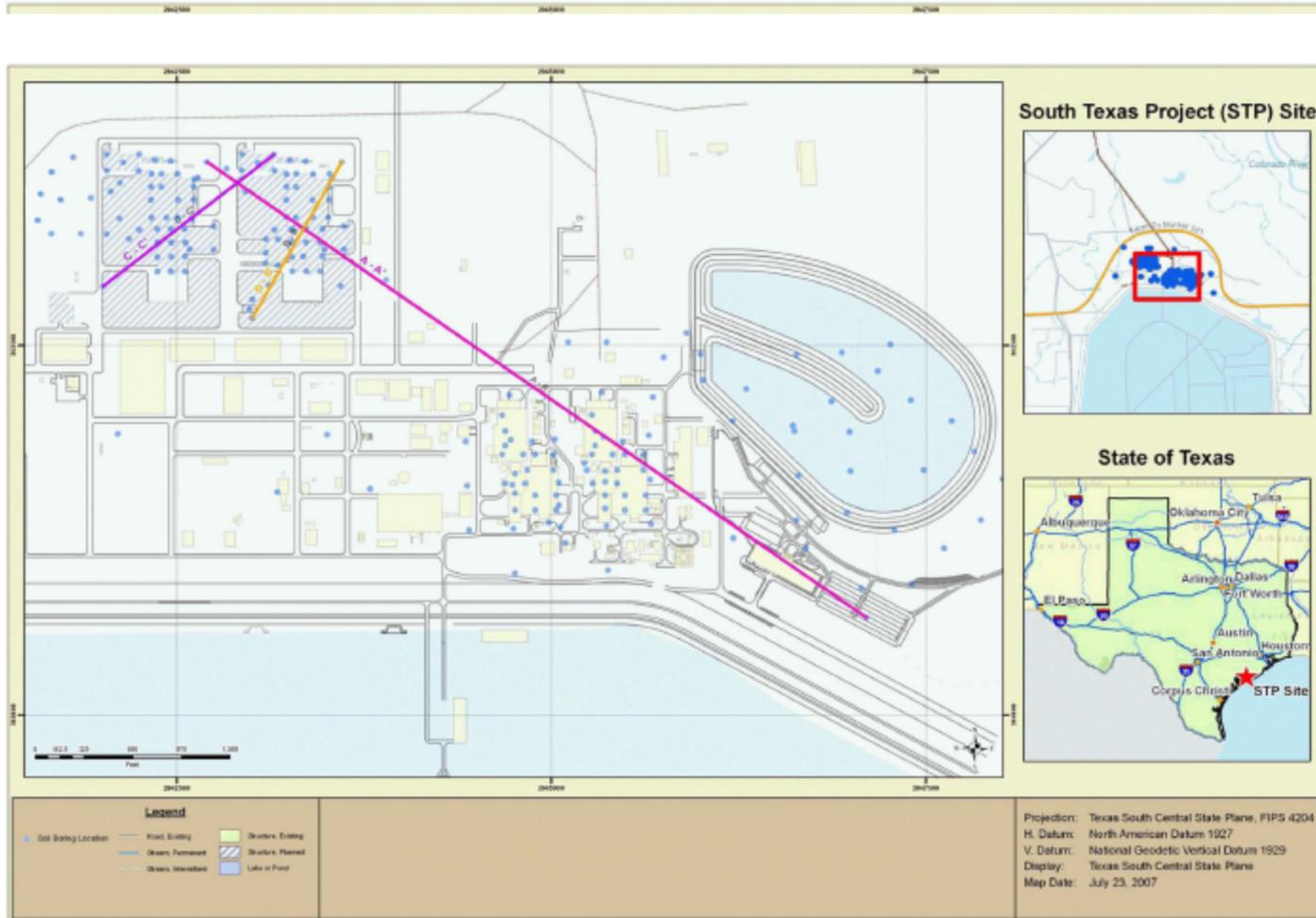
2.SS.1-1.35

STP 3 & 4

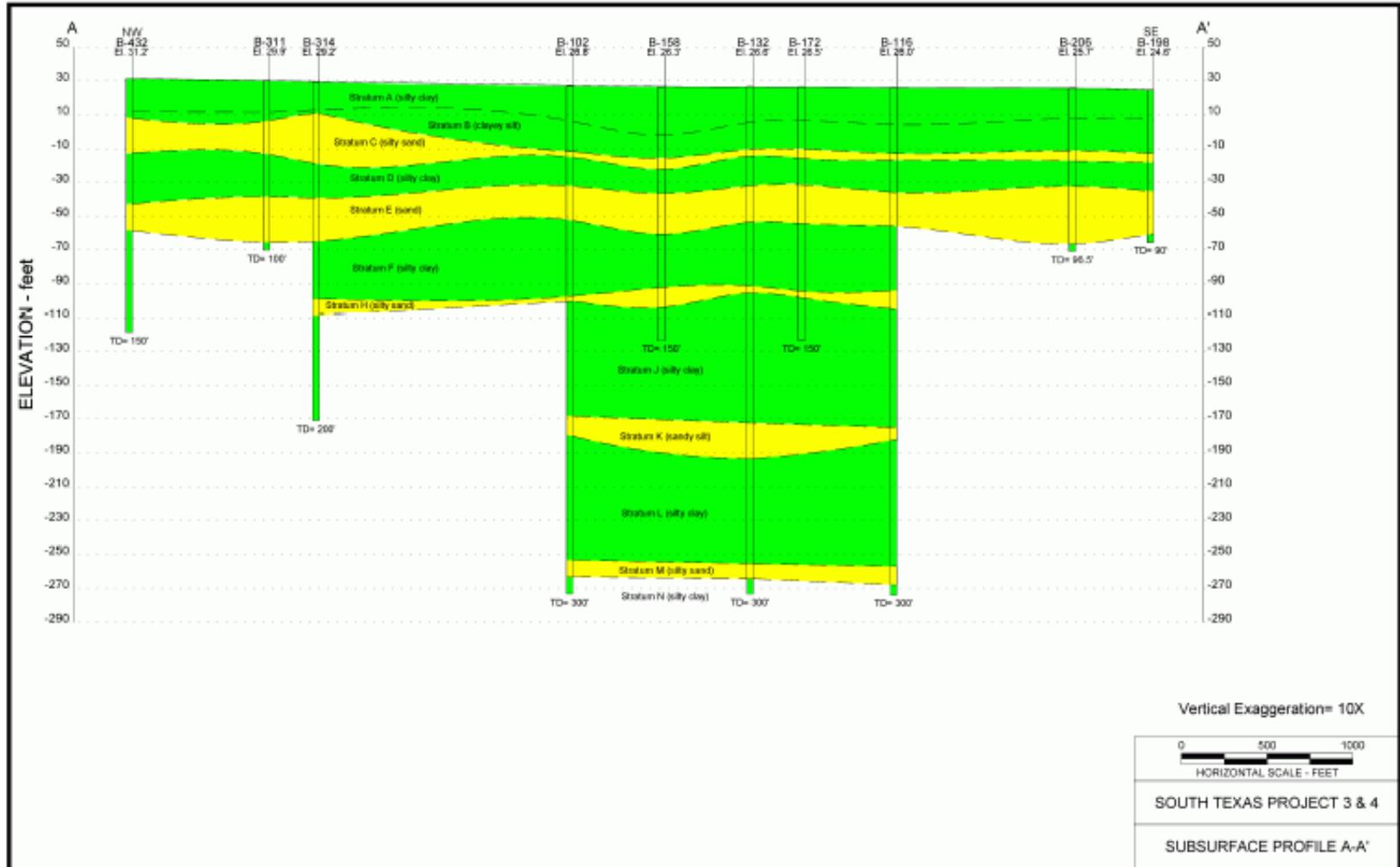
Rev. 07

Final Safety Analysis Report

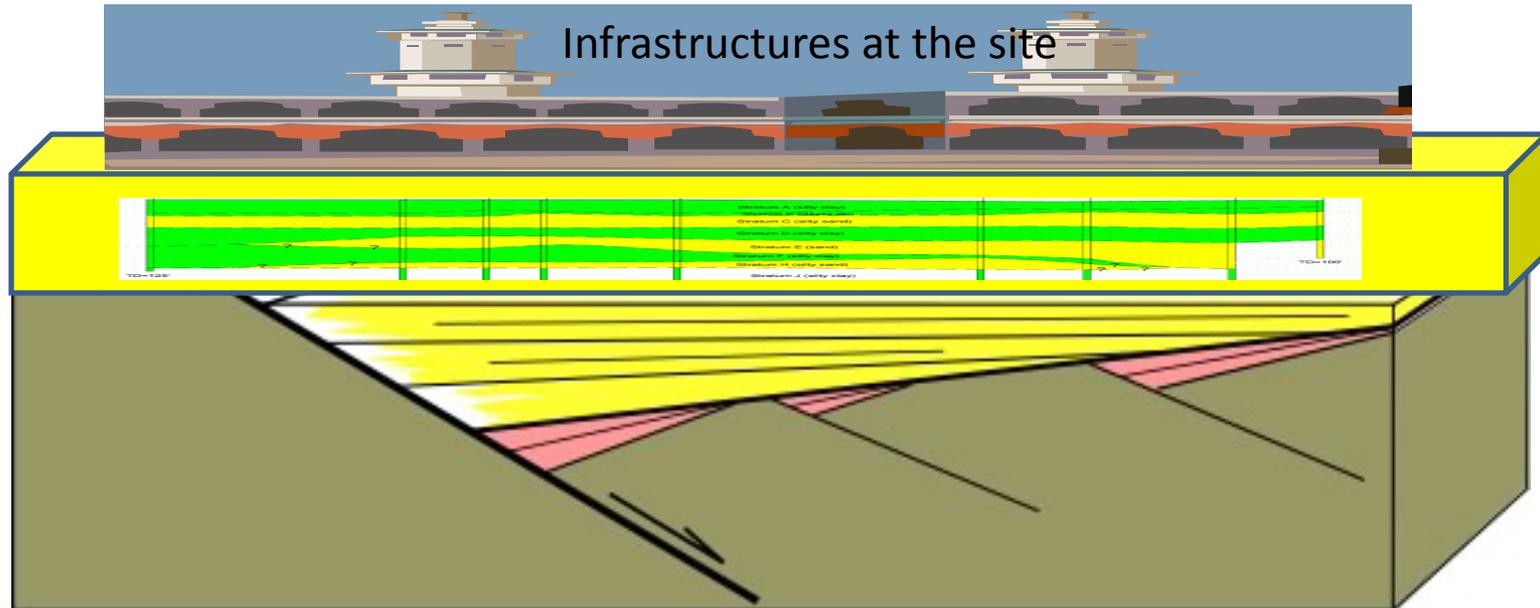
Basic Geologic and Seismic Information



Continuation of Subsurface Strata



For Safety Related Structures



Safety of MCR

- MCR was put into operation in 1983, and all the MCR related structures observed no deformation
- Even if those growth faults, GMO and GMP, are or become active, the moving rate is so small that site safety will not be affected

Embankment of MCR (built in 1983)



Staff Conclusions on Growth Faulting at STP Units 3 & 4

- The applicant incorporated a range of appropriate methods to evaluate any potential for surface deformation due to growth faulting at the STP site
- There is no evidence of growth faulting that would pose a hazard to safety-related structures
- Geologic Mapping License Condition will check for faulting under safety-related structures, including growth faults

Section 2.5.2

Vibratory Ground Motion

No open items

Staff will discuss in detail evaluation of the Fukushima Recommendation 2.1 RAI response in Chapter 22.1

Section 2.5.4
Stability of Subsurface
Materials and Foundations

Backfill Open Item

Open Item 02.05.04-37

Requests the applicant provide the types of tests and frequency of testing that will be used to define the engineering properties of the Backfill.

Backfill OI Resolution

Engineering Properties ITAAC

Performance of specified engineering tests on borrow materials at specified testing frequency in accordance with the ITAAC.

An engineering report will detail results and demonstrate that all material properties supporting Category 1 structures meet or exceed values assumed in site-specific design analyses.

Reasonableness of Approach

ITAAC Table 3.0-11 ensures borrow material properties are consistent with those values assumed in the design analyses.

Engineering Properties ITAAC acceptable because

- large factors of safety
- redundancy in testing

**ACRS Subcommittee Presentation
SER with no OIs Chapter 2.5**

Discussion/Committee Questions

Back Up Slide (Section 2.5.4)

Tests and Frequency

<u>Test</u>	<u>Minimum No. of Tests</u>	<u>Criterion for Acceptance Unless Approved by Engineer of Record</u>
Grain Size ASTM D6913	1 per material type per source	Complies with Specifications
Organic Matter ASTM D2488	1 per material type per source	Complies with Specifications
Specific Gravity ASTM D854	1 per material type per source	Complies with Specifications
Modified Proctor ASTM D1557	1 per material type per source	Maximum Dry Density Will Result in a Saturated Total Unit Weight $\geq 120 \text{ lb/ft}^3$
Constant Head Permeability ASTM D2434	1 per material type per source	Complies with Specifications
pH ASTM G51	1 per material type per source	Complies with Specifications
Chloride Content EPA SW-846 9056/300.0	1 per material type per source	Complies with Specifications
Sulfate Content EPA SW-846 9056/300.0	1 per material type per source	Complies with Specifications
Resistivity ASTM G 57	1 per material type per source	Complies with Specifications
Consolidated Drained Triaxial Shear USACE EM-1110-2-1906 Appendix X (30 Nov. 70)	1 per material type per source	$\phi' \geq 30^\circ$
Consolidation ASTM D2435	1 per material type per source	Compression of fill layer results in settlement consistent with values computed during design
Resonant Column Torsional Shear University of Texas Procedure PBRCTS-1	1 per material type per source Test at 4 to 6 isotropic confining stress values	Maximum shear modulus, modulus ratio, and damping ratio consistent with upper range and lower range values used for soil-structure interaction analysis

Back Up Slide (Section 2.5.4) Backfill ITAAC

Table 3.0-11 Backfill Under Category I Structures

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
<p>3. The engineering properties of backfill to be used under Seismic Category I structures bound the values used in the site-specific design analyses.</p>	<p>3. Laboratory tests, field measurements and analyses of engineering properties of the backfill will be performed.</p> <p>These tests will include:</p> <p>Test: Grain Size Distribution Frequency: 1 per material type per borrow source</p> <p>Test: Specific Gravity Frequency: 1 per material type per borrow source</p> <p>Test: Modified Proctor Frequency: 1 per material type per borrow source</p> <p>Test: Drained Triaxial Shear Frequency: 1 per material type per borrow source</p> <p>Test: Consolidation Frequency: 1 per material type per borrow source</p> <p>Test: Resonant Column/Torsional Shear Frequency: 1 per material type per borrow source</p>	<p>3. An engineering report exists that concludes that the engineering properties of backfill to be used under Seismic Category I structures (unit weight, phi angle, shear strength, shear modulus, shear modulus degradation and damping ratio) meet the values used in the site-specific design analyses.</p>

Back Up Slide (Section 2.5.4)

Table 2.5S.4.5.3-1 Quality Control Recommendations for Structural Fill

<u>Material</u>	<u>Test</u>	<u>Minimum Sampling and Testing Frequency¹</u>
Structural Fill	Field Density	<p>For backfill placed in trenches and surrounding structures: Minimum 1 sample per 200 cubic yards placed, sample taken at suspect areas, and at least one per every lift.</p> <p>Elsewhere: Minimum 1 sample per 500 cubic yards placed, sample taken at suspect areas, and at least one per every lift.</p>
	Moisture	One test for each Field Density test
	Moisture-Density Relationship (Modified Proctor)	<p>One test for every borrow area and material type and any time material type changes.</p> <p>Additional test for every 10 Field Density test (ASTM D1557)</p>
	Gradation	One test for each Moisture-Density test. (ASTM D 6913)
	Atterberg Limits	One test for each Moisture-Density test. (ASTM D 4318) for backfill types appropriate for this test.
	Material Type	Soil must come from an approved borrow source. Other soil sources must be tested and approved.

Presentation to the ACRS Subcommittee

South Texas Units 3 and 4 COL Application Review

SER Phase 4 Chapter 22

“Requirements Resulting From Fukushima Near-Term Task Force Recommendations”

April 9, 2014

Staff Review Team

Chapter 22

- **Project Managers**

- Tom Tai, DNRL/LB3, Project Manager

- **Technical Staff Presenters**

- Sarah Tabatabai, RGS2, Geologist
- Raul Hernandez, BPFP, Reactor System Engineer
- Kim Gambone, NSIR, EP Specialist

Technical Topics

Chapters 22.1, 22.3, and 22.4

- Chapter 22.1 Seismic (and Flood Hazard)
Re-Evaluations (NTTF 2.1)
- Chapter 22.3 SFP Instrumentations (NTTF 7.1)
- Chapter 22.4 Emergency Preparedness and
Regulatory Actions (Staffing and
Communications) (NTTF 9.3)

Background

- March 11, 2011, Great Tohoku Earthquake and Tsunami in Japan
- July 12, 2011, SECY-11-0093 made twelve recommendations
- September 9, 2011, SECY-11-0124 identified near term safety improvement
- October 3, 2011, SECY-11-0137 identified two more for near term safety improvement
- February 17, 2012, SECY-11-0025, staff proposed orders and RAI to be issued

Background (cont'd)

- March 12, 2012, Orders EA-12-049 and EA-12-051
- May 2, 2012, issued Requesting for Additional Information RAI 01.05-01 to 01.05-04 to NINA for actions on NTTF Recommendations 2.1, 4.2, 7.1, and 9.3, respectively
- June 25, 2012, in response to the above RAIs, STP added Appendix 1E, “Response to NRC Post-Fukushima Recommendations”
- NTTF Recommendation 4.2, “Mitigative Strategies,” will be presented to ACRS in September 3, 2014

NTTF Recommendation 7.1

“Spent Fuel Pool Instrumentations”

- STP proposed to enhance the SFP level instrument design
- New Appendix 1E.2.6 SFP Instrumentation (7.1) describes the design requirements of the SFP level instrument that are consistent with JLD-ISG-2012-03
- ITAAC 3.0-28 verifies that the SFP level instrument meets all the design features described in FSAR Appendix 1E.2.6.
- FSAR 13.5 includes commitments to develop procedures for the use and maintenance (including testing and calibration) of the SFP level instrument.

NTTF Recommendation 9.3 “Emergency Preparedness and Regulatory Actions”

- NEI 12-01 will be used to assess staffing and communication capabilities.
- Results addressed in Emergency Plan and Emergency Plan Implementing Procedures
- Applicant proposed ITAAC
- Staff proposes License Condition
- Confirmatory item to incorporate text from response to RAI 01.05-3 to FSAR, Appendix 1E.2.8

Outline

NTTF Recommendation 2.1

“Seismic Hazard Re-Evaluations”

- Background Related to Seismic Hazard Reevaluations
- CEUS-SSC Model Summary
- Summary of Applicant’s Seismic Hazard Reevaluations
- Summary of the Staff’s Review
- Staff Conclusions

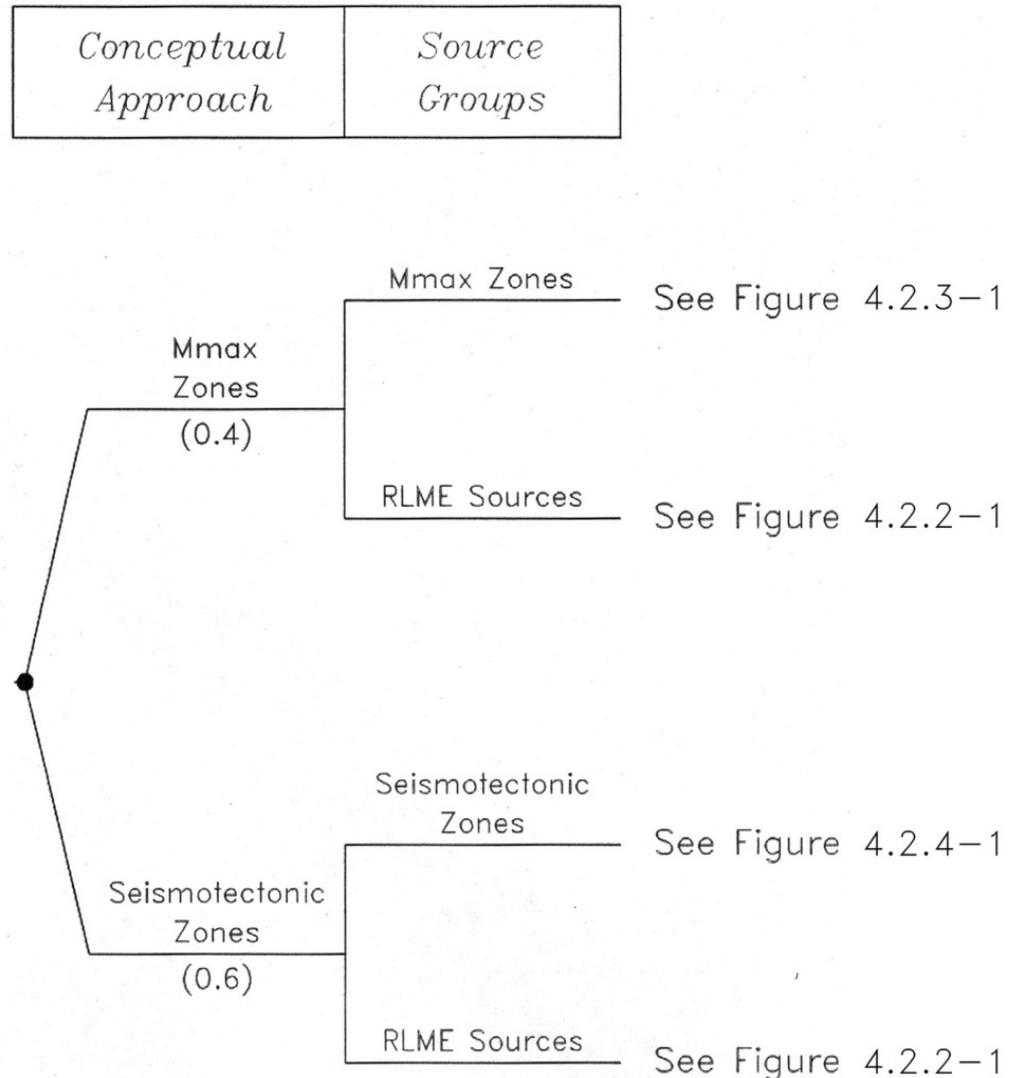
Background Related to Seismic Hazard Reevaluations

- STP 3 & 4 COL FSAR Section 2.5.2 GMRS is based on an updated EPRI-SOG (1986) seismic source model and the EPRI (2004, 2006) GMM
- **ACRS Action Item #97:** Will it be necessary to determine the impact of the new seismic source characterization model on the results obtained using the EPRI-SOG model?
- NRC issued RAI 01.05-1 in May, 2012 , which addressed Recommendation 2.1 of the Fukushima Near-Term Task Force recommendations:
 - a) Evaluate the potential impacts of the Central and Eastern United States Seismic Source Characterization (CEUS-SSC) model (NUREG-2115) on the seismic hazard
 - b) Modify the site-specific GMRS and FIRS if it's determined that changes are necessary given the evaluation performed in part a) above
- The staff's review of the applicant's RAI response is detailed in SER Section 22.1

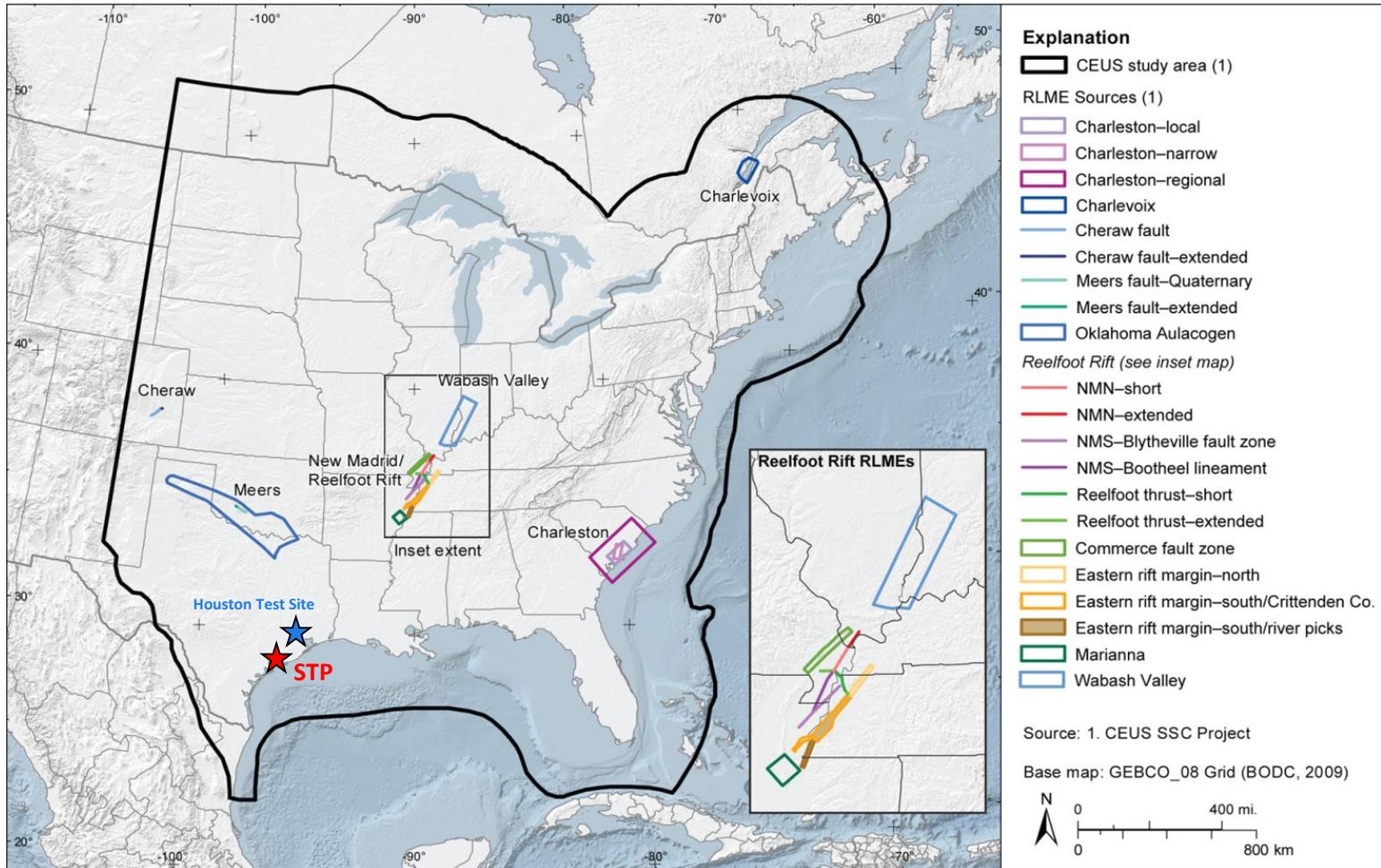
CEUS-SSC Model Summary

Three types of seismic sources models:

- Mmax Zones
- Seismotectonic Zones
- Repeated Large Magnitude Earthquake (RLME) Sources

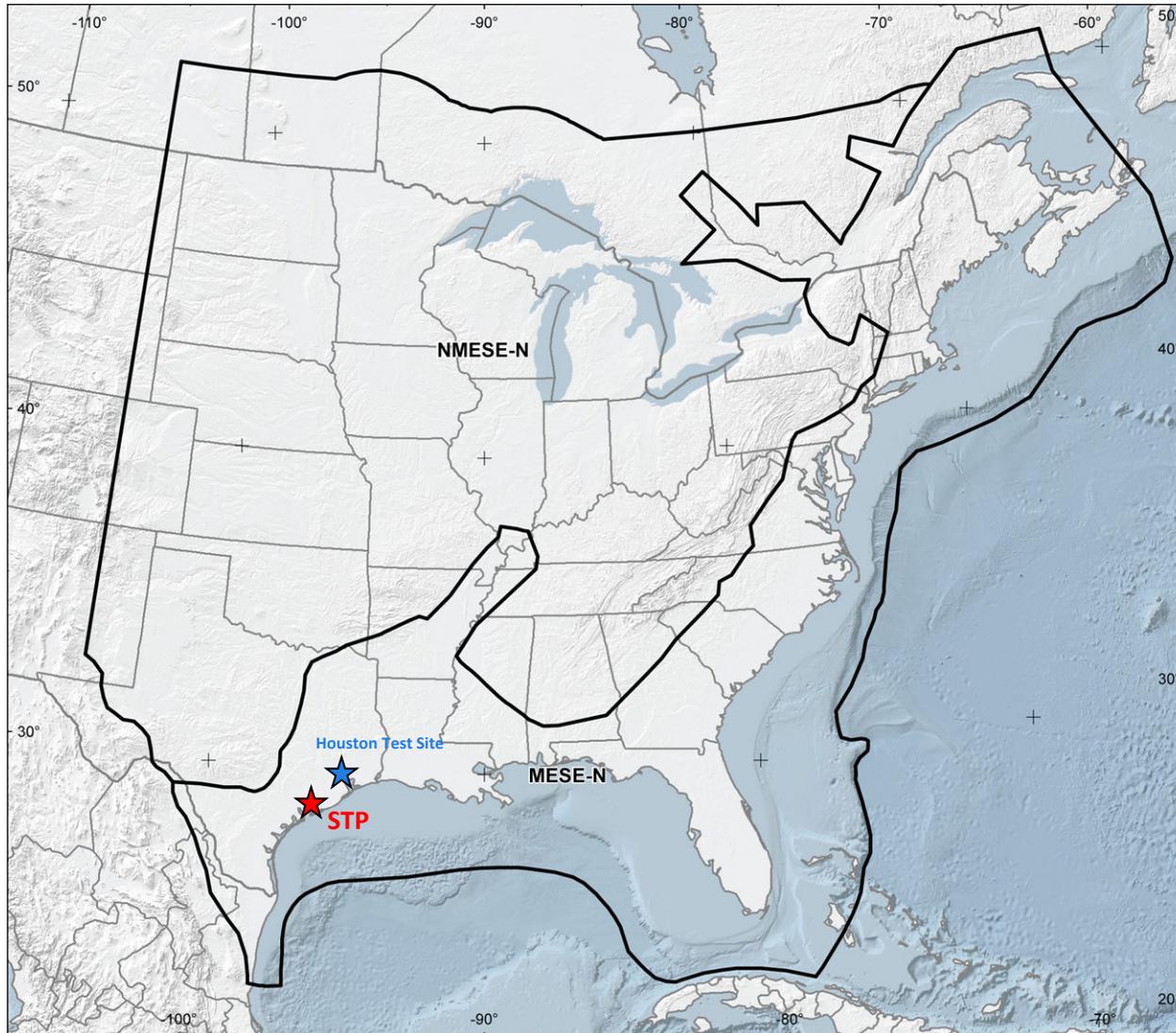


CEUS-SSC Model Summary (Cont'd)



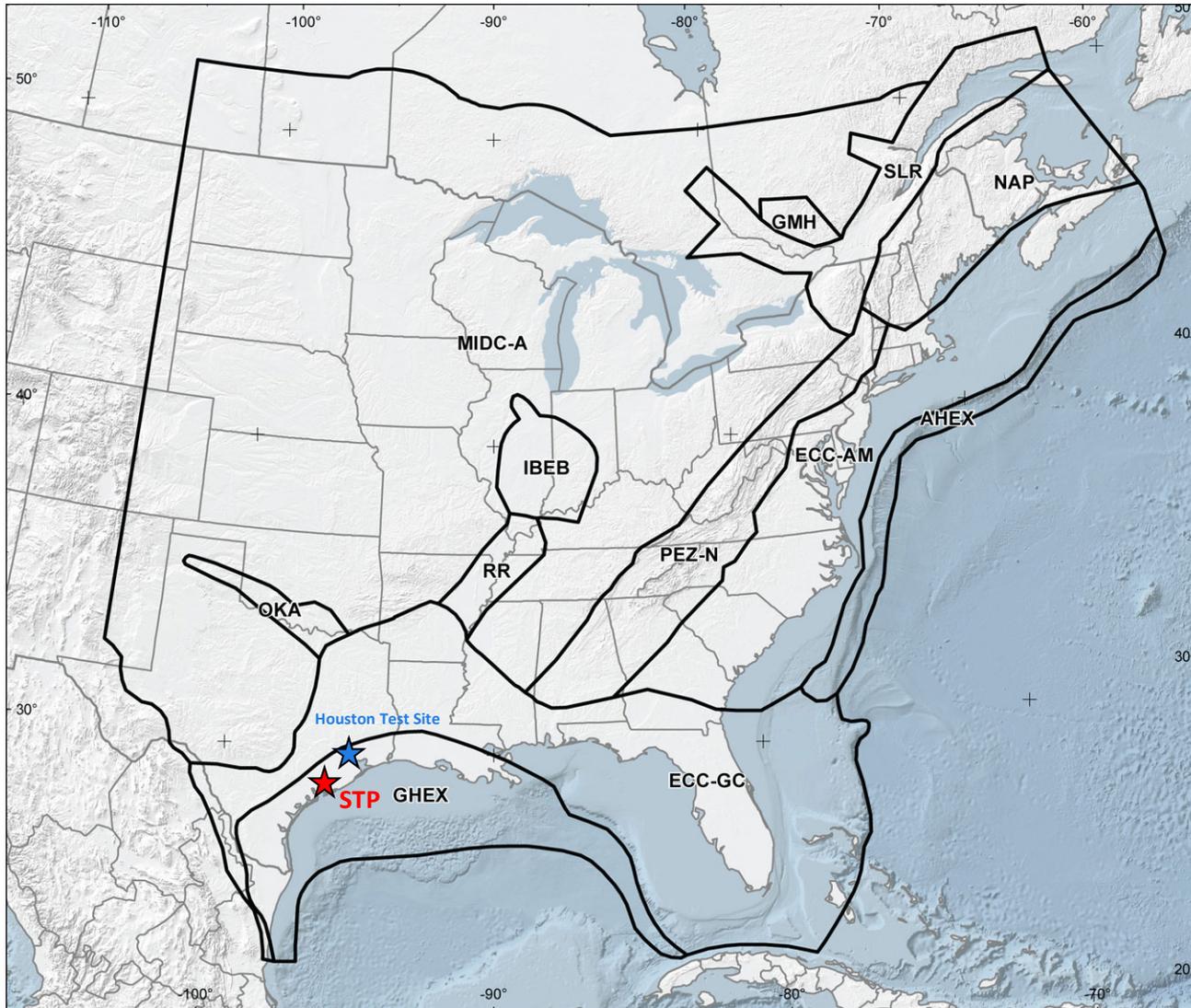
Repeated Large Magnitude Earthquake (RLME) Sources are defined as having had two or more earthquakes with $M \geq 6.5$.

CEUS-SSC Model Summary (Cont'd)



Mmax zones are based on average or “default” characteristics that are representative of large areas of the CEUS and are based on historical seismicity and broad-scale geologic and tectonic data.

CEUS-SSC Model Summary (Cont'd)

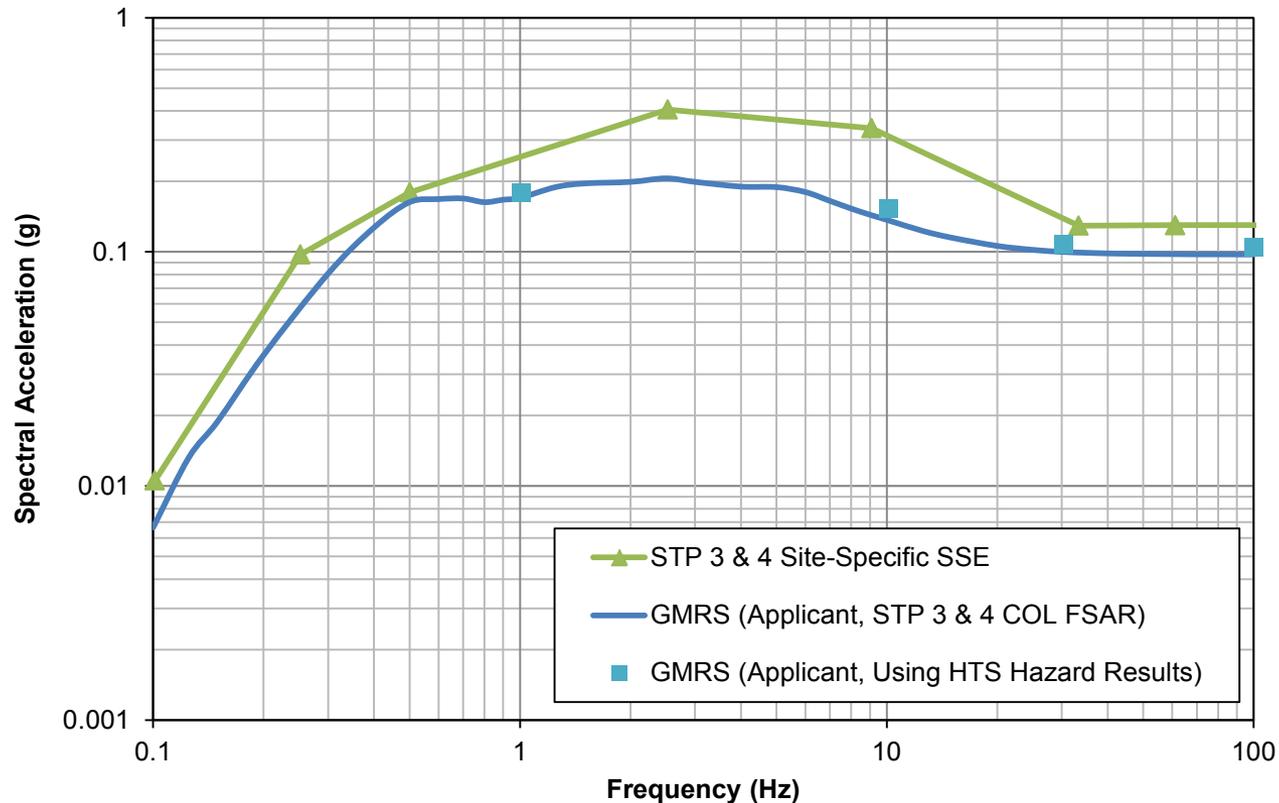


Seismotectonic zones are based on historical seismicity and regional-scale geologic and tectonic data to characterize seismic sources zones at a finer scale than the Mmax zones model.

Summary of Applicant's Seismic Hazard Reevaluations

- Applicant evaluated the potential impact of the CEUS-SSC model on the characterization of seismic hazards at the STP site using the 1-, 10-, and 100-Hz hard rock hazard curves for the nearby Houston Test Site
 - Applicant concluded that both sites share similar geologic and tectonic settings, and also have similar activity rates (STP-updated EPRI-SOG model and CEUS-SSC models)
- Applicant estimated 10^{-4} and 10^{-5} spectral accelerations at 30 Hz by applying ratio of PGA to 30-Hz STP-updated EPRI SOG rock motions to the Houston Test Site CEUS-SSC PGA value
- Developed a hard rock CEUS-SSC GMRS and then applied STP site-specific amplification factors (i.e. FSAR Table 2.5.2-21S) to obtain the STP site-specific GMRS

Summary of Applicant's Seismic Hazard Reevaluation (Cont'd)

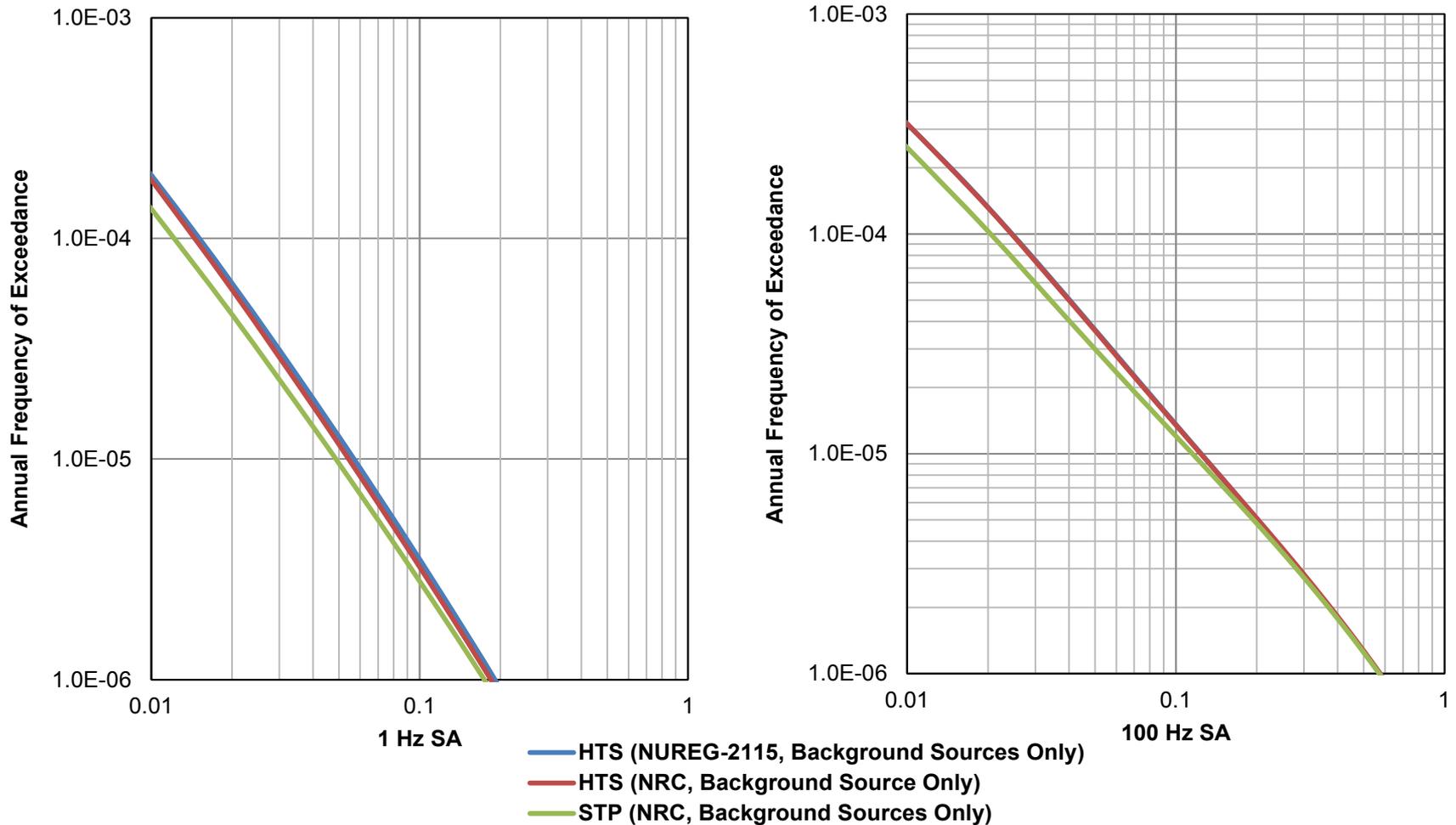


- Applicant concluded that STP COL application GMRS did not need to be revised:
 - The CEUS-SSC STP GMRS (blue squares) is very close to, and not significantly above, the STP COL application GMRS (blue curve), while the site-specific SSE (green curve) envelopes both

Summary of the Staff's Review

- In order to confirm the applicant's assumption that the Houston Test Site hazard curves are appropriate for estimating the hard rock hazard at the STP site, the staff performed a confirmatory PSHA for the STP site and the Houston Test Site
 - Used CEUS-SSC model (NUREG-2115) along with EPRI (2004, 2006) ground motion model (GMM)
- Compared the confirmatory 1-, 10-, and 100- Hz hazard curve results with the Houston Test Site results contained in the NUREG-2115 report

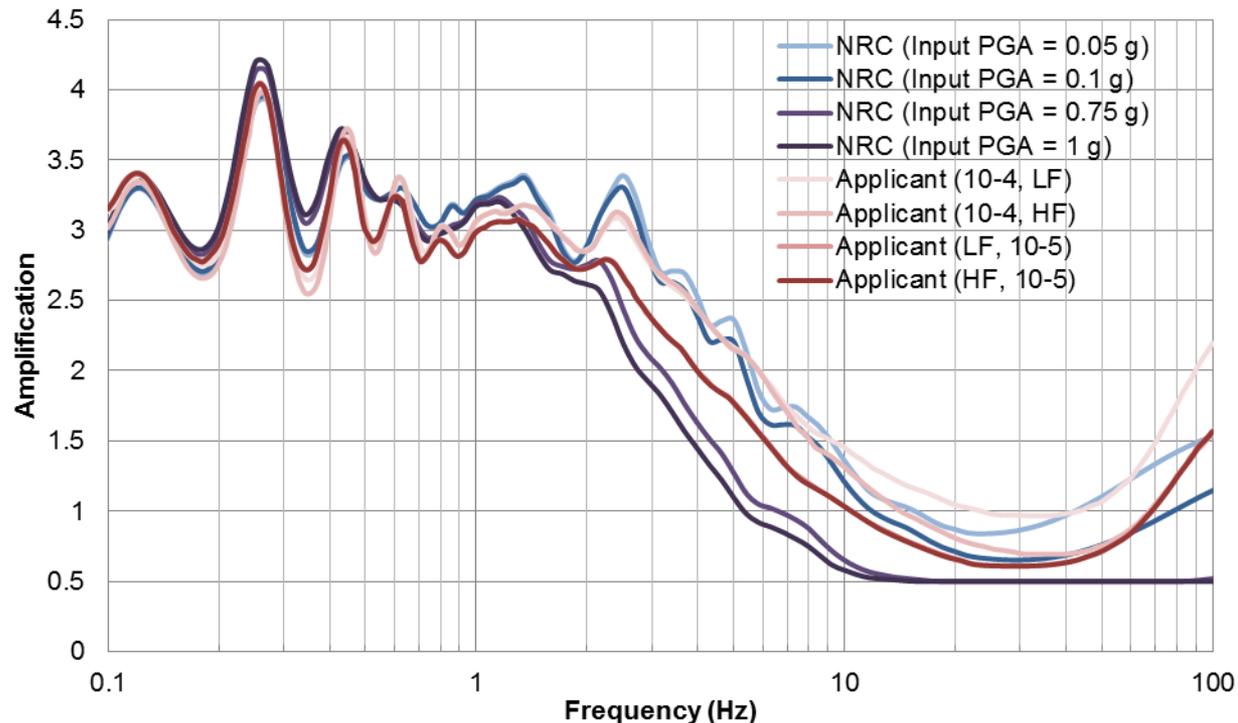
Summary of the Staff's Review (Cont'd)



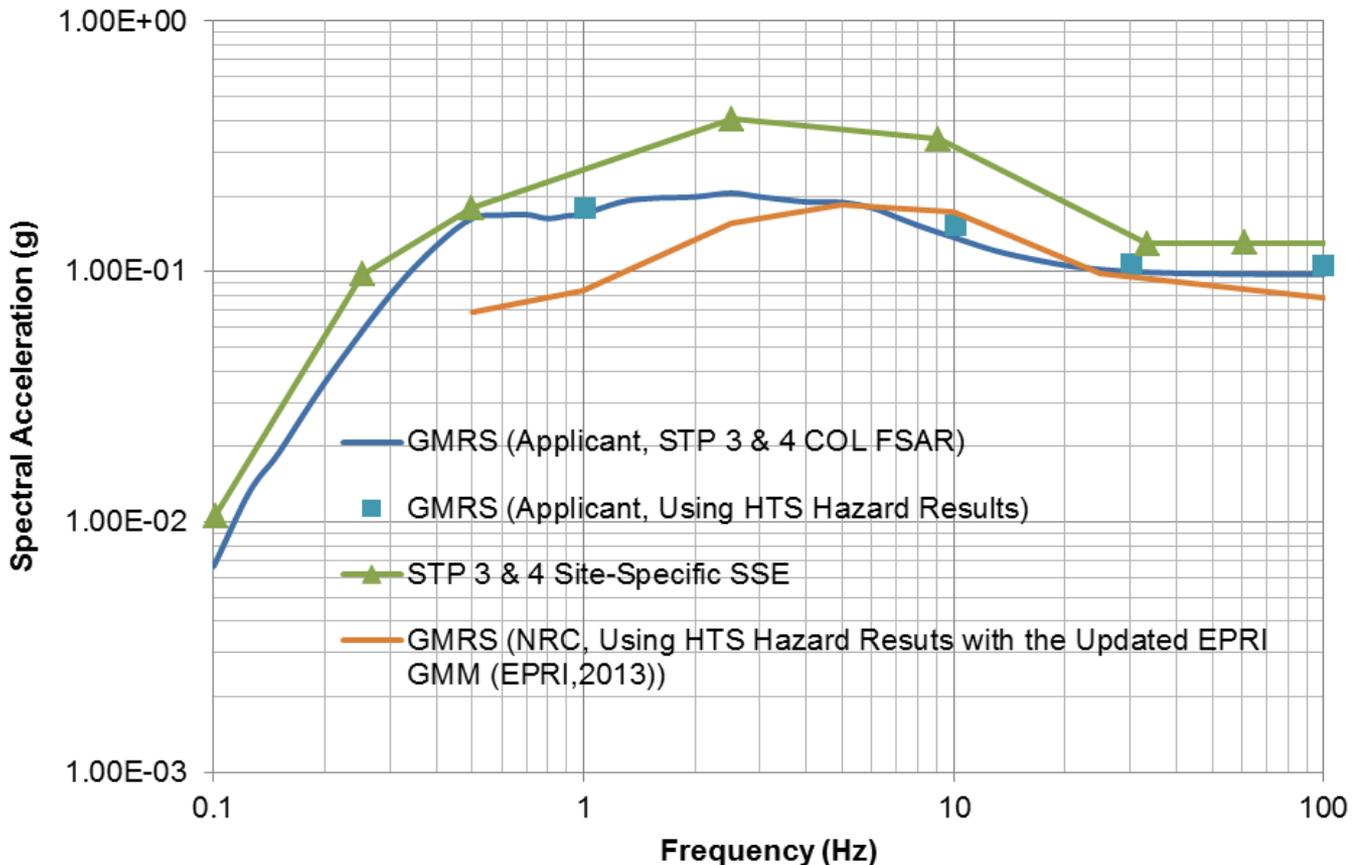
- Staff concluded that the COL applicant's use of NUREG-2115 hazard curves for the Houston Test Site for 1 Hz, 10 Hz, and 100 Hz, an adequate substitute for performing hazard calculations at the STP site using the CEUS-SSC model.

Summary of the Staff's Review (Cont'd)

- In order to determine the adequacy of the applicant's GMRS, the staff performed a confirmatory site response calculation and used the resulting amplification functions along with CEUS-SSC hard rock hazard curves for the Houston Test Site to develop probabilistic soil hazard curves and a GMRS

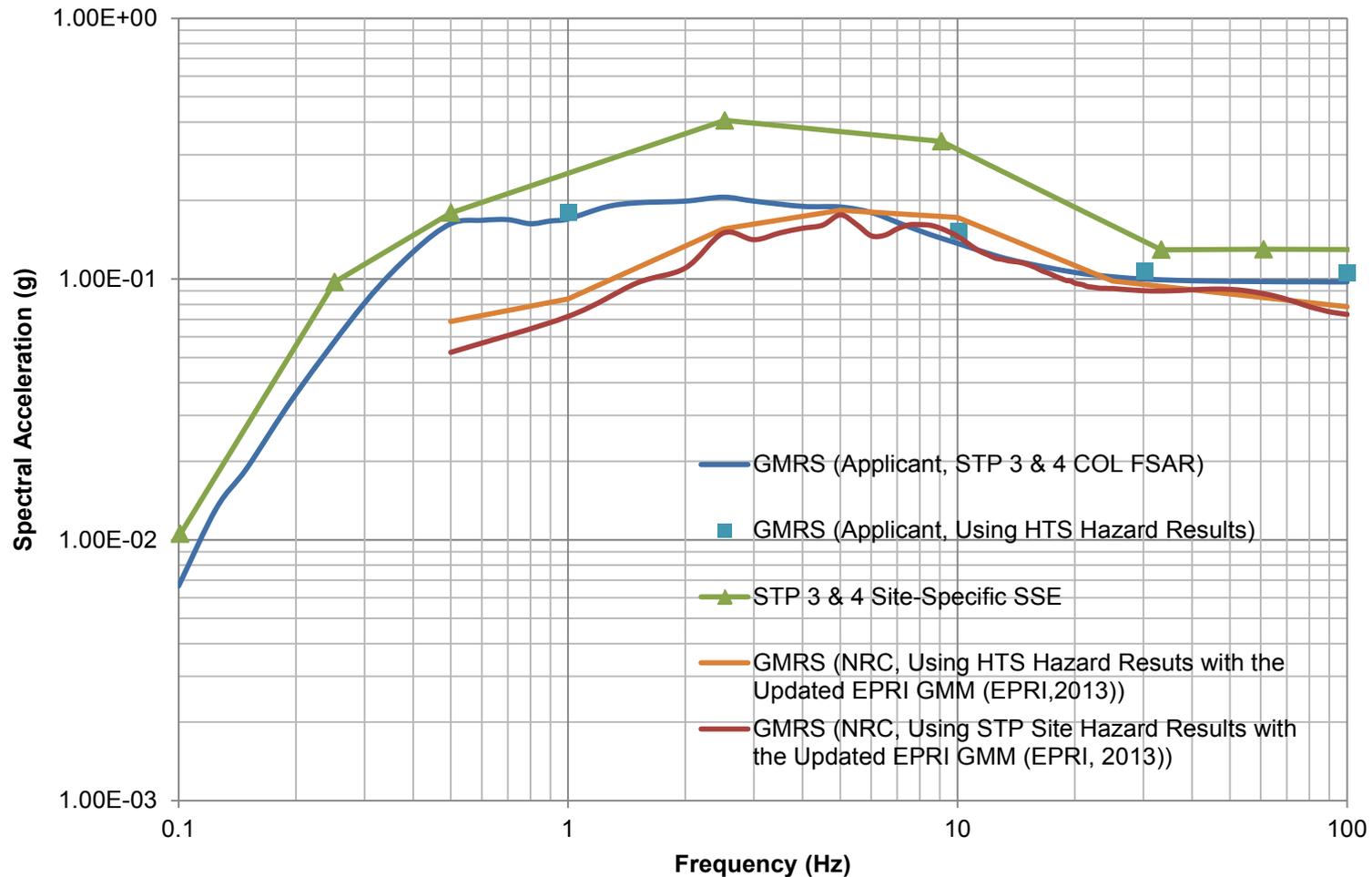


Summary of the Staff's Review (Cont'd)



- The applicant's CEUS-SSC GMRS and the staff's confirmatory CEUS-SSC GMRS, which are based on the use of CEUS-SSC model for the Houston Test Site, are well below the STP 3 & 4 Site-Specific SSE

Summary of the Staff's Review (Cont'd)



- This figure shows the staff's recent GMRS using the CEUS-SSC model for the STP site

Staff Conclusions

- The applicant's use of the NUREG-2115 demonstration hazard calculations for the Houston Test Site—instead of directly performing hard rock seismic hazard calculations for the STP site—is adequate because the staff's confirmatory analysis results showed that the CEUS-SSC hazard results at the STP site are similar to, or lower than, the hazard at the Houston Test Site.
- The applicant adequately calculated the site-specific GMRS at 1, 10, 30, and 100 Hz using the CEUS-SSC model
- The staff's CEUS-SSC GMRS is well below the STP Units 3 and 4 COL FSAR GMRS for the entire 0.5- to 100-Hz frequency range with the exception of 10 Hz.
- Based on the above conclusions, no revisions to the STP Units 3 and 4 COL FSAR GMRS are necessary.

**SER w/ no OIs – Chapter 22
Fukushima Near-Term Task Force
Recommendations 2.1, 7.1, and 9.3**

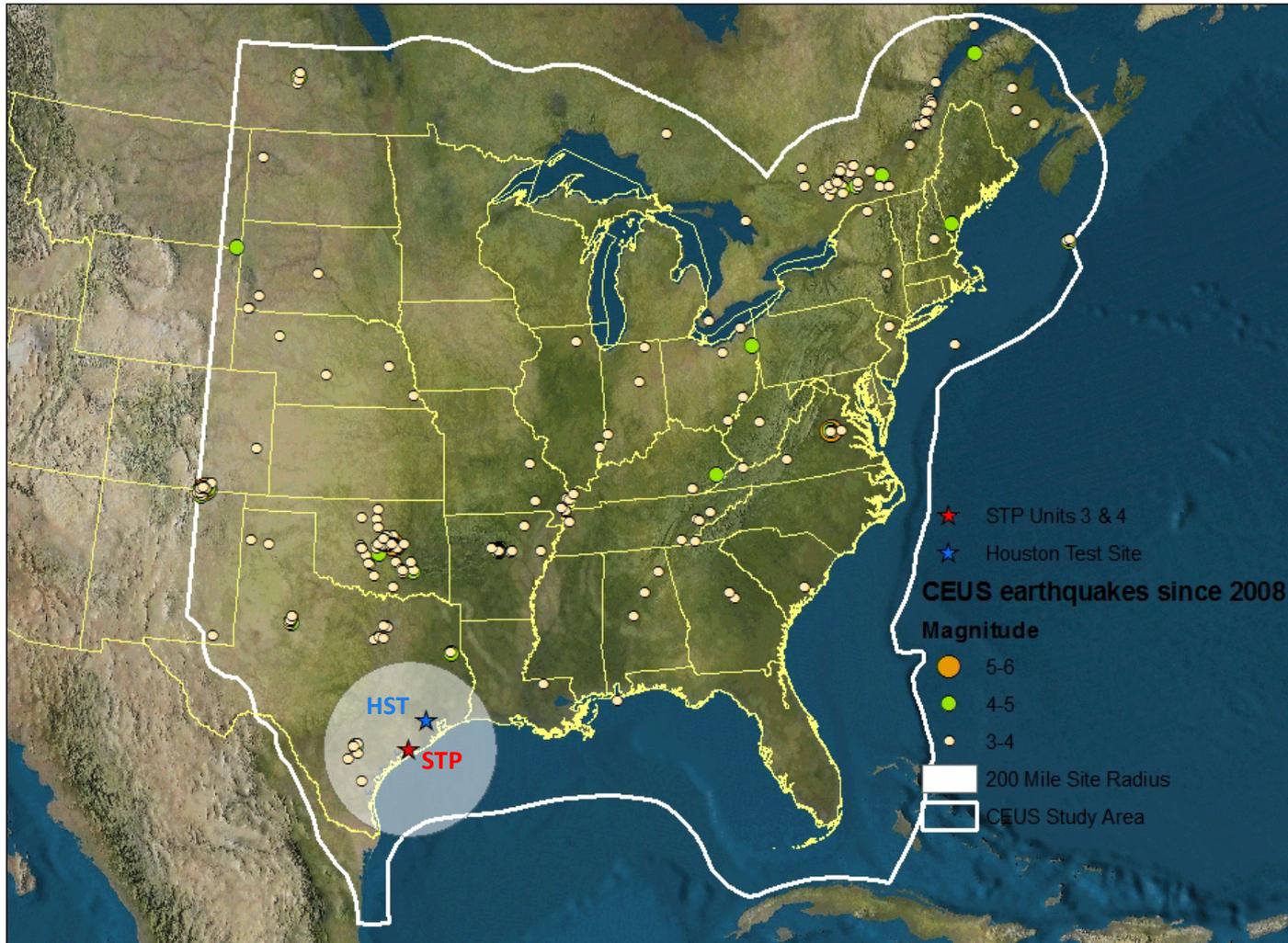
Discussion/Committee Questions

**ACRS Subcommittee Presentation
SER with no OIs Chapter 2**

**Fukushima Near-Term Task Force
Recommendation 2.1: Seismic Reevaluation**

Back up Slides

CEUS SSC Model Study Region, Test Sites, and STP



Key Features of the CEUS SSC Model

- Earthquake catalog covering entire study region for the period of 1568 till the end of 2008.
- Earthquake size is defined in terms of moment magnitude (**M**).
- Consist of single set of alternative sources with defined master logic tree depicting alternative interpretations.
- For distributed seismicity source zones two approaches (Bayesian and Kijko) were used for the Mmax distribution.
- Upper truncation to all Mmax distributions is 8.25 and lower truncation is 5.5.
- Smaller cell sizes of 1/4x1/4-degree to 1/2x1/2-degree.



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Updated Guidance for Assessment of Flooding Hazards due to Dam Failure

Action Item 106

Christopher Cook, Ph.D.

Chief, Hydrology and Meteorology Branch

April 9, 2014

ACRS/ABWR Subcommittee

Follow-up: Action Item 106

- The NRC's staff review of the STP COL application resulted in lessons learned regarding treatment of uncertainty in dam break analysis
- Incorporated into JLD-ISG-2013-01, "Guidance for Assessment of Flooding Hazards due to Dam Failure," July 2013. (ML13151A153)
- Applied as part of NTTF Recommendation 2.1, reevaluated flood hazard analysis.

Developing the ISG...

- **Interagency Committee on Dam Safety (ICODS) formed special Working Group**
 - **ICODS serves as the permanent forum for the coordination of Federal activities associated with dam safety and security.**
- **Held numerous public meetings with NEI-lead task force on flooding hazards**
- **Received numerous comments from both working groups and members of the public. (ML13151A161)**

ISG Layout

- Contains numerous Staff Positions
- Allows for high level screening of all dams in a watershed to identify ‘critical’ dams
- Critical dams are then evaluated in detail against all potential failure modes.
- Potential failure modes are grouped into three overarching categories:
 - Hydrologic, Seismic, Sunny-Day

Detailed Failure Analysis

- Hydrologic Failure
 - A dam should be assumed to fail due to hydrologic hazard if it cannot withstand its basin specific PMF, with associated effects.
- Seismic Failure
 - A dam should be assumed to fail if it cannot withstand the relevant seismic hazards
 - 10^{-4} annual exceedance seismic hazard combined with a 25-year flood
 - half of the 10^{-4} ground motion, combined with a 500-year flood.

(ISG-2013-01 page 1-8)

Detailed Failure Analysis (continued)

- Sunny-Day Failure
 - Because no widely accepted current engineering practice exists for estimating failure rates on the order of at the 1×10^{-6} per year, sunny-day failure should be assumed to occur and the consequences estimated.
(ISG-2013-01 page 1-9)

Federal Dams

- In the case of dams and levees owned or operated by U.S. Federal agencies, the Federal agency responsible for (owner or operator of) the dam should be involved in any discussions, including possibly reviewing any analysis performed.
- If a Federally owned dam is identified as critical to the flooding reanalysis, the licensee should contact the NRC promptly. The NRC will act as the interface between these agencies and licensees.

(ISG-2013-01 page 1-11)

Breach Uncertainties

- Because of the large uncertainties, inconsistencies and potential biases associated with breach modeling, licensees should not rely on a single modeling method.
- Instead, licensees should compare the results of several models judged appropriate. Justification should be provided for the selection of the candidate models used as well as the value(s) for the specific model.
- Model and parameter uncertainty as well as parameter sensitivity in final results should be explicitly addressed. (ISG-2013-01 page 7-7)

Questions?

