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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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ABWR SUBCOMMITTEE

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WEDNESDAY

APRIL 9, 2014

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ROCKVILLE, MARYLAND

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

ACRS CONSULTANT:

WILLIAM HINZE

DESIGNATED FEDERAL OFFICIAL:

MAITRI BANERJEE

ALSO PRESENT:

SCOTT HEAD, NINA

JOE LITEHISER, Bechtel Power Corporation

DICK SCHEIDE, NINA

NRC STAFF:

CHRISTOPHER COOK, NRO

REBECCA KARAS, NRO

YONG LI, NRO

TEKIA GOVAN, NRO

SARAH TABATABAI, NRO

TOM TAI, NRO

FRANKIE VEGA, NRO

T-A-B-L-E  O-F  C-O-N-T-E-N-T-S

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

(8:30 a.m.)

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

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

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

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

emergency preparedness regulatory actions related to staffing and communications.

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

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

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

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

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

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

CHAIRMAN CORRADINI: Do you need to tell us anymore?

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

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

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

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

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

Anything else you want to say, Tom?

MR. TAI: No.

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

MR. HEAD: Yes, sir.

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

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

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

So the agenda for today is we're going to

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

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

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

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

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

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

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

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

MR. HEAD: Sure.

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

MR. HEAD: Piping? You mean like --

MR. HINZE: Well, any underground facilities.

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

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

So is there some other --

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

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

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

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

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

MEMBER STETKAR: Ground water's pretty high here.

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

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

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

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

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

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

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

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

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

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

respect to our previous analysis.

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

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

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

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

valid regarding our original GMRS and the SSE.

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

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

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

CHAIRMAN CORRADINI: John?

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

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

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

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

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

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

CHAIRMAN CORRADINI: Which line?

MEMBER STETKAR: Any of them.

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

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

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

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

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

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

MR. HEAD: Yes, sir.

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

MR. HEAD: Yes, sir.

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

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

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

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

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

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

MEMBER STETKAR: Okay, pick any.

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

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

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

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

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

basically updated, if I can use that --

MR. LITEHISER: No, absolutely.

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

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

MEMBER STETKAR: Yes.

MR. LITEHISER: And some of the activity rates.

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

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

MEMBER STETKAR: They revised some of the --

MR. LITEHISER: They re-plot the curves.

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

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

really entered --

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

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

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

MALE PARTICIPANT: Can you say that slower please?

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

MR. LITEHISER: With the updated sources.

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

MR. LITEHISER: Okay.

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

MR. LITEHISER: Right.

MEMBER STETKAR: Regardless of that. If

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER STETKAR: I can show you more off line.

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

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

CHAIRMAN CORRADINI: The solid blue line.

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

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

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

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

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

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

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

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

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

(Crosstalk)

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

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

MR. HEAD: Dash line.

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

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

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

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

CHAIRMAN CORRADINI: That part I get.

MEMBER STETKAR: Solid blue line is a

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

FEMALE PARTICIPANT: It's 9 o'clock.

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

CHAIRMAN CORRADINI: But you don't understand.

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

CHAIRMAN CORRADINI: Okay, noted.

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

MR. HEAD: But if your question is

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

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

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

MEMBER STETKAR: Yes.

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

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

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

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

dashed --

MR. HEAD: They redid it, okay.

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

MR. HEAD: Okay. Bill?

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

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

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

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

the SSHAC process is a --

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

MR. LITEHISER: Scroll up.

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

MR. LITEHISER: Yes.

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

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

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

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

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

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

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

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

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

MR. HEAD: Of last year?

CHAIRMAN CORRADINI: Yes.

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

discussed some three or four years ago.

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

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

CHAIRMAN CORRADINI: Yes.

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

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

CHAIRMAN CORRADINI: John just noted that he --

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

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

MEMBER STETKAR: Yes. I'm searching for

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

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

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

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

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

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

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

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

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

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

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

MR. HEAD: Right.

MR. HINZE: You mean the hard rock.

MR. HEAD: Yes, sir.

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

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

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

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

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

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

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

MR. LITEHISER: Absolutely, yes.

MR. HINZE: Thank you.

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

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

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

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

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

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

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

MR. HINZE: No, that's good.

CHAIRMAN CORRADINI: Scott?

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

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

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

MR. HEAD: Okay. And again, this TI

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

MALE PARTICIPANT: Okay.

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

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

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

There's two permanent fixed instrument

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

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

MEMBER STETKAR: Yes.

MR. HEAD: Yes, sir.

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

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

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

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

MEMBER STETKAR: Good. Thank you.

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

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

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

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

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

MR. HEAD: Right.

MEMBER STETKAR: They go away.

MR. SCHEIDE: In normal operation we've

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

CHAIRMAN CORRADINI: Okay, thank you.

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

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

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

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

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

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

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

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

CHAIRMAN CORRADINI: I would think you would.

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

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

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

CHAIRMAN CORRADINI: Thank you.

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

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

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

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

Today the staff is here to present the

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

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

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

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

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

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

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

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

At the last ACRS meeting in November 2011,

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

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

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

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

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

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

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

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

Yes, Bill?

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

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

So multiple depths for safety related structure.

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

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

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

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

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

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

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

MR. LI: Yes.

CHAIRMAN CORRADINI: Okay. I just wanted

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

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

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

MR. HINZE: Can I interrupt you for --

MR. LI: Absolutely.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. LI: Space, spacing.

MR. HINZE: Space.

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

MR. HINZE: What about in time?

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

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

(Crosstalk)

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

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

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

MR. HINZE: Thank you.

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

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

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

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

2 study for the detecting the growth fault.

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

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

MR. HINZE: Even reflection. Reflection.

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

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

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

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

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

MR. LI: Yes.

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

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

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

right up to the surface?

MR. LI: Projected to the surface.

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

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN CORRADINI: Okay.

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

MR. HINZE: Yes, licensing --

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

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

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

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

CHAIRMAN CORRADINI: They're just there

as obstructions or -- yes.

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

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

MR. HINZE: Seismicity is not a problem.

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

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

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

MR. LI: It's generally unrelated.

CHAIRMAN CORRADINI: Okay. Why?

FEMALE PARTICIPANT: Sedimentation over time.

CHAIRMAN CORRADINI: Because of just the

geology is such that --

MR. LI: Yes.

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

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

CHAIRMAN CORRADINI: And that's the dominant process?

MR. LI: Yes.

CHAIRMAN CORRADINI: Okay, thank you.

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

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

But this is a mapping which indicates the

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MR. LI: Yes, it goes this way.

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

MALE PARTICIPANT: The three dots up there.

MR. HINZE: Three dots. Do those --

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

MR. HINZE: Are those growth faults?

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

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

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

MR. HINZE: Go ahead.

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

So first evidence, the boring indicates

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

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

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

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

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

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

So here's the animation you expected.

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

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

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

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

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

MR. LI: Yes.

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

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

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

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

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

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

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

MR. LI: The pond.

MEMBER BLEY: The main cooling reservoir.

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

MEMBER BLEY: I know, but it represents something.

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

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

MALE PARTICIPANT: It's a what pond?

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

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

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

MR. LI: Beaumont layer.

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

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

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

MR. LI: Exactly.

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

MR. LI: That has it all there.

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

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

MEMBER BALLINGER: A hundred feet.

MR. LI: Yes.

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

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

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

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

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

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

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

MR. LI: Okay.

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

MR. LI: Yes, okay. Yes.

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

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

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

MS. GOVAN: Are there any --

MR. LI: Next please.

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

MR. LI: Oh, okay.

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

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

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

MR. LI: In the --

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

MR. LI: SER?

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

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

MR. HINZE: Okay, yes.

MR. LI: Yes.

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

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

seismologists are scratching their head why this is going on.

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

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

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

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

consideration of that in the 2.5 SER?

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

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

MR. LI: I know.

MR. HINZE: Because those magnitudes are --

MR. LI: Are long, right.

MR. HINZE: -- generally less than three.

MR. LI: Yes.

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

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

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

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

MR. HINZE: Absolutely.

MR. LI: -- with fracking activity.

MR. HINZE: You're absolutely right.

MR. LI: Because you just actually --

MR. HINZE: But it --

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

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

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

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

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

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

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

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

MR. LI: Bob Young's --

MR. HINZE: Yes.

(Crosstalk)

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

MR. LI: Okay.

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

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

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

CHAIRMAN CORRADINI: Yes.

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

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

MR. HINZE: Exactly.

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

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

question is no.

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

CHAIRMAN CORRADINI: Oh, okay.

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

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

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

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

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

the catalogue for that.

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

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

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

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

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

MR. HINZE: No.

MS. KARAS: -- up to that date?

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

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

MR. HINZE: That's right.

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

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

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

CHAIRMAN CORRADINI: It's in the SER?

MR. LI: Yes.

CHAIRMAN CORRADINI: Oh, okay.

(Off microphone comments)

CHAIRMAN CORRADINI: Got it.

MR. LI: And I think that --

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

MR. LI: Okay.

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

MR. LI: Yes, okay.

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

CHAIRMAN CORRADINI: Sure. I'm sorry.

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

CHAIRMAN CORRADINI: Understood.

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

MR. HINZE: That's a different problem.

MR. HEAD: Okay. Okay.

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

MR. HEAD: Okay.

MR. HINZE: It's the disposal.

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

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

MR. HINZE: Right.

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

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

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

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

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

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

MS. BANERJEE: Sarah coming?

CHAIRMAN CORRADINI: Yes.

MS. BANERJEE: Okay. Thanks.

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

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

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

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

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

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

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

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

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

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

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

MS. GOVAN: Any questions relating to 2.54?

CHAIRMAN CORRADINI: Questions by the committee?

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

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

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

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

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

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

MS. GOVAN: Correct. Yes.

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

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

CHAIRMAN CORRADINI: We're now on the record.

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

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

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

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

little bit out of order.

FEMALE PARTICIPANT: That's where I start.

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

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

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

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

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

MR. TAI: That's correct.

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

MR. TAI: Let me use my disc.

MEMBER STETKAR: We don't have those.

CHAIRMAN CORRADINI: Yes, we do.

MS. GOVAN: Do you have your disc.

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

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

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

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

CHAIRMAN CORRADINI: Oh, okay.

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

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

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

MR. TAI: Okay. There you go.

MS. BANERJEE: Okay.

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

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

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

FEMALE PARTICIPANT: Page 4.

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

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

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

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

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

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

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

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

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

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

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

CHAIRMAN CORRADINI: Questions by the committee? No?

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

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

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

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

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

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

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

There are three main types of seismic

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

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

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

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

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

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

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

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

CHAIRMAN CORRADINI: You're making that noise.

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

CHAIRMAN CORRADINI: Don't worry about it.

(Laughter)

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

problem.

MEMBER STETKAR: What?

MS. TABATABAI: Okay.

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

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

CHAIRMAN CORRADINI: Don't worry about it.

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

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

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

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

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

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

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

CHAIRMAN CORRADINI: Okay.

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

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

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

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

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

CHAIRMAN CORRADINI: Okay, got it. Thank

you.

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

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

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

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

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

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

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

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

MS. TABATABAI: Right.

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

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

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

MS. TABATABAI: Yes.

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

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

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

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

MS. TABATABAI: Well --

CHAIRMAN CORRADINI: They took their soil --

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

MEMBER BROWN: They're pretty close.

MS. TABATABAI: Yes.

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

MS. TABATABAI: Yes.

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

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

CHAIRMAN CORRADINI: So it's a suitable surrogate.

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

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

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

CHAIRMAN CORRADINI: Okay.

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

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

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

CHAIRMAN CORRADINI: Sure. Okay. Got it.

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

CHAIRMAN CORRADINI: You going to ask her a question?

MEMBER STETKAR: Yes.

CHAIRMAN CORRADINI: I figured that.

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

MS. TABATABAI: Yes.

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

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

them or compare them for this purpose.

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

MS. TABATABAI: Yes.

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

MS. TABATABAI: Certainly.

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

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

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

MEMBER STETKAR: Okay.

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

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

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

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

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

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

of acceleration from .01g to .1g.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MS. TABATABAI: Me? No, no.

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

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

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

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

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

CHAIRMAN CORRADINI: So let me just --

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

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

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

MR. HINZE: Absolutely.

MEMBER STETKAR: Absolutely.

CHAIRMAN CORRADINI: Right?

MEMBER STETKAR: That's the big issue.

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

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

MEMBER STETKAR: And indeed there are.

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

MEMBER STETKAR: Fan out.

MEMBER RICCARDELLA: -- fan out?

MEMBER STETKAR: Bingo.

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

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

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

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

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

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

MEMBER STETKAR: Okay.

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

MEMBER STETKAR: That's fair enough.

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

CHAIRMAN CORRADINI: But just so I say it

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

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

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

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

CHAIRMAN CORRADINI: Okay.

MS. KARAS: -- person to explain it.

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

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

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

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

MEMBER STETKAR: Okay.

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

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

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

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

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

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

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

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

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

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

MS. TABATABAI: Yes.

CHAIRMAN CORRADINI: And your calc is the

orange?

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

CHAIRMAN CORRADINI: They ask in their presentation?

MS. TABATABAI: Yes.

CHAIRMAN CORRADINI: Got it.

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

CHAIRMAN CORRADINI: Got it.

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

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

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

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

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

CHAIRMAN CORRADINI: Okay.

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

CHAIRMAN CORRADINI: Then my question, forget my question.

MS. TABATABAI: Okay.

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

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

MS. TABATABAI: The calculation of --

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

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

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

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

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

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

CHAIRMAN CORRADINI: Okay. Thank you.

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

MR. HINZE: Yes. Probably --

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

MR. HINZE: Sure.

MEMBER STETKAR: Absolutely. I'll put my

--

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

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

MEMBER STETKAR: We'll need pretty big ones.

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

MEMBER STETKAR: That will be a humbling experience.

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

MEMBER RICCARDELLA: On the uncertainties.

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

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

MEMBER RICCARDELLA: Yes.

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

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

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

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

MEMBER STETKAR: Got it.

MR. HEAD: Okay. Thank you.

MEMBER RICCARDELLA: I think it's more of

a generic question --

MEMBER STETKAR: Yes.

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

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

MS. KARAS: Yes. That's correct.

CHAIRMAN CORRADINI: Okay.

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

MR. TAI: Okay?

CHAIRMAN CORRADINI: Okay.

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

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

MR. TAI: 106, yes.

CHAIRMAN CORRADINI: Okay. Thank you.

(Off microphone comments)

MR. COOK: Good morning.

CHAIRMAN CORRADINI: Good morning. And you are?

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

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

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

CHAIRMAN CORRADINI: So you're tentless.

MR. COOK: I'm tentless.

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

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

CHAIRMAN CORRADINI: All right.

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

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

MEMBER STETKAR: No tent for Dr. Cook.

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

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

Put it up there.

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

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

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

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

lessons learned from this process were going through

And what I presented to you was incorporated in this ISG, and what we had done. And then also, I was going to mention sort of how we're using this and applying it. Because it was developed -- As you know, this is a JLD-ISG. So this is an Interim Staff Guidance that was developed for the purposed of performing the recommendation 2.1, flooding hazard assessments there.

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

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

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

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

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

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

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

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

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

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

MR. HINZE: May I ask a question?

MR. COOK: Yes.

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

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

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

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

upstream of it.

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

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

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

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

MR. HINZE: Dam by dam?

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

MR. HINZE: Thank you.

MR. COOK: Yes. Any other questions?

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

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

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

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

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

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

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

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

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

for the JLD-ISG.

MEMBER STETKAR: Chris --

MR. COOK: Yes.

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

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

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

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

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

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

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

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

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

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

MEMBER STETKAR: I'm asking two things.

The 25 year flood and the 500 year flood --

MR. COOK: Sure.

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

MR. COOK: Yes.

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

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

MR. COOK: Right.

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

MR. COOK: Right.

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

MR. COOK: Oh, sure, sure.

MR. COOK: There might be uncertainties. Why not request the applicant, the licensees or the

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

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

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

(Crosstalk)

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

MEMBER STETKAR: Yes.

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

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

MR. COOK: Well in fact --

MEMBER STETKAR: We had some discussions

about this.

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

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

MR. COOK: Yes.

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

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

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

MR. COOK: Sure.

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

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

failure.

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

CHAIRMAN CORRADINI: Okay. That's fine.

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

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

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

MEMBER STETKAR: You left yourself open.

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

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

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

We also looked at its capacity that was

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

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

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

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

Of course, their purview is not regulating

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

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

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

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

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

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

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

Okay. So the second bullet is just saying they should do this. And the licensees, and the reason why I have this written as licensees and not applicants is because again, we were doing this for the 2.1 reviews. Obviously, if this gets incorporated into our guidance going forward for new reactors, we'd be talking about applicants as well. But they should be doing this promptly when they get through any of the screening.

Okay, next slide. So this really gets at,

Dr. Corradini, your question. You were looking at STP and the breach uncertainties. And at that ACRS meeting that was there almost a year ago, there was a lot of discussion.

Several presentations that were there, approximately four hours worth of discussions dealing with the uncertainties that were there, the inconsistencies that were there. And really a lot of the outcomes and the lesson learned from a lot of that, if you go back and going through it is, there was a lot of question about relying on one particular method.

You know, there are multiple different formulations. There are multiple technical journal articles out there about a particular, you know, about different breach regression equations. And some of them, some published some things on them. Other people have published other things on them. They were developed on certain catalogues of dam information, certain dam failures that were there.

And so really, the thing that came out of that, I think the biggest lesson learned was not to rely on one particular formulation. What you really want to do is, you want to look at multiple different formulations that are out there, compare the results

together, look at them to see how they vary.

And then go through and judge, and provide a justification as to why you, you know, selected that particular regression equation that was there, as well as the value that results that come out of it, and the conservatisms that were taken as you went through those calculations.

And really, what we wanted to make sure that we had, especially in the 2.1 reviews was that documentation, that description of the justification as to why they did it. And then also explicitly talking about the parameter uncertainty and the range of values, and the results that came out, to help understand them when you put them into context.

CHAIRMAN CORRADINI: So, if I were to day it differently.

MR. COOK: Sure.

CHAIRMAN CORRADINI: To take us back a year --

MR. COOK: Yes.

CHAIRMAN CORRADINI: Where we came out of this is, there was no problem necessarily with South Texas. We were just trying to understand why they were put through so many paces simultaneously. And the

answer is, given -- Now, this is my interpretation of what you just said.

Given the low probability of the event, and how big of an effect it is, you wanted to look at a range of models, to make sure that however, whatever model you picked, things looked okay. That's what I heard you say.

MR. COOK: And in essence, you'll see that in staff's SER, where they talked about the different regression equations. You'll talk about the different ways they went about it. You'll talk about the different values that came out.

And ultimately the justification is then written in the SER as to why this was selected, why it was okay. And then also why we felt like it was the value that the, you know, applicant selected was fine, and we felt that we had reasonable assurance of safety.

CHAIRMAN CORRADINI: Okay. But I was close. Good.

MR. COOK: Yes, no, you were.

CHAIRMAN CORRADINI: Okay.

MR. COOK: Probably just should have said yes.

CHAIRMAN CORRADINI: That's okay. I'm

happy with this. Any members of the subcommittee want to ask additional questions? No?

MS. BANERJEE: Yes.

MR. HINZE: Well, let me ask one question if I may? Are you promoting any research into trying to developing a more unified theory of breaching, and the related problems?

MR. COOK: We have looked forward. And we're actively working with your Office of Research to look, you know, at dam failure. I mean, if you look at the hazards I think that could potentially impact fleet wide nuclear power plants that are in there, certainly there are a number of sites throughout the fleet that are susceptible should an upstream dam fail.

And so it's certainly one that, you know, my branch is looking at. And always trying to figure out methods to improve the state of the science. And in fact, we're actually even doing it with a lot of our, you know, reviews as we're doing with the 2.1 recommendation.

You know, we're reaching out, you know, to experts, like we were with STP actually, you know, to get their opinions, as well as look at the justification, you know, to understand sort of the

values that come out. As far as a unified theory for say, you know, one equation that matches all, it's very hard to I think --

MR. HINZE: Parameterize.

MR. COOK: Yes, exactly. And given the rarity of large dams failing, given, you know, the rarity of even sort dams that are very well constructed, they're a very uncommon event. However, they do occur. So we need to, you know, progress, and again, look at the data catalogues that are there, and advance as much as we can.

MR. HINZE: We have all these regression equations --

MR. COOK: Yes.

MR. HINZE: -- and ideas to bring that uncertainty down, by bringing them closer together. And if we can try to relate the parameters of the dam and the event to the results, we'd be, we could decrease that uncertainty.

MR. COOK: Right. I mean, and, you know, there are also other classes of models that are out there too that also exist, you know, beyond regression equations. But the NRC got into the physically based models, where you're actually looking at the structure.

MR. HINZE: Yes.

MR. COOK: You know, when you have that type of failure introduced, and you have it physically going through. So you have the structural models of that as you go forward. And there are those. It's another class of model. It wasn't what was done for STP. But those also exist.

So, I mean, I hope I think where the, you know, this is my technical area, where I think this technical area's going to go in the future. But I think that, you know, having it right now, I can't point to anything. But we're certainly trying to promote it.

MR. HINZE: But the level of knowledge on this certainly looks like it could be enhanced, and improve your predictions.

MR. COOK: Exactly. And there is still a lot of, I'll grant you that. There is a lot of technical expert judgment that comes into looking at these, and what are reasonable when you look at it.

CHAIRMAN CORRADINI: So to put Bill's question more directly. Is there a user need that you've expressed to research that they'll act on? In the terms of the connection between NRO and NRR and RES?

MR. COOK: We have a larger enveloping

research plan.

CHAIRMAN CORRADINI: Oh, do you? Okay.

MR. COOK: Yes. And so that research plan is being developed right now. It's something that was talked about at the January 6th Commission meeting that was there.

CHAIRMAN CORRADINI: Okay.

MR. COOK: Bill Ott, Dr. Bill Ott was there to talk about it. I know that we're ongoing with it. We're actually meeting this Friday to talk about another draft of it that's there.

CHAIRMAN CORRADINI: Okay.

MR. COOK: But dam failures is one of the components in that research plan, yes.

CHAIRMAN CORRADINI: Maitri, you had a question.

MS. BANERJEE: Yes. I just wanted to ask the members. We discussed three Action Items, 96 and 97, resulting from Professor Hinze's questions, and this Number 106. So the members all decide we can close them now, or not?

CHAIRMAN CORRADINI: Let's finish today. But my feeling is yes. But we'll go around the table.

MS. BANERJEE: Okay.

CHAIRMAN CORRADINI: Just to make sure.

MS. BANERJEE: Thank you.

CHAIRMAN CORRADINI: Any questions though for Dr. Cook? You look like you're free.

MR. COOK: Great.

CHAIRMAN CORRADINI: Escape while you can.

MR. COOK: Thank you for that. All right.

CHAIRMAN CORRADINI: Okay. Before we go around the table, I want to ask to get the phone line opened up to see if there's public comment. I'll look behind me to see anybody wants to make a comment in the room. Hearing nobody racing to the mic, I think the answer is no.

So can we open up the phone line to see if somebody's out there that wants to make a comment? And if anybody's out there, could you kind of cough, or make a noise, so we know you're --

MEMBER STETKAR: It's not open.

(Off microphone comments)

CHAIRMAN CORRADINI: It's open.

MS. BANERJEE: The line is open.

CHAIRMAN CORRADINI: Okay. Anybody out there? Okay. Let's close the line since nobody's out

there. And let's go around the table. I'll start on the left. Pete, can you kind of give me your thoughts of today?

And then, in particular, just to remind you all, we purposely structured today, besides 2.5, to kind of discuss the open items from previous times. So if you have any issues about those too. Pete?

MEMBER RICCARDELLA: No. I think other than the question that John raised about the variability in the seismic curves, I don't see any issues. And I think that's more of a generic issue, not a STP site specific issue.

CHAIRMAN CORRADINI: Okay. Bill?

MR. HINZE: Well, I think the applicant and the staff has done a very good job on this. I reviewed their reports very carefully. And I think they've done an excellent job.

As far as the open items, I think that perhaps we've sensitized the staff to the need for really being very careful about those growth faults and the mapping of them.

But I think we're ready to close that down. I think that in terms of the CEUS, it was a natural progression to the response to the Fukushima Near-Term

requirements. So I think we're in clear shape on both of those open items.

CHAIRMAN CORRADINI: Okay.

MEMBER BLEY: Nothing to add.

MEMBER STETKAR: I don't have anything additional to add as far as, you know the Action Items.

CHAIRMAN CORRADINI: Okay.

MEMBER STETKAR: I agree those are --

CHAIRMAN CORRADINI: Okay. Thank you, sir.

MEMBER STETKAR: You're welcome, sir.

CHAIRMAN CORRADINI: Dr. Ryan?

MEMBER RYAN: I just want to add my appreciation. The staff and the applicant have done a very good job, I think, of coordinating their reviews. And it's clear they've done a lot of work to bring it to one story, and understand it, you know, all around. So, congratulations.

CHAIRMAN CORRADINI: Charlie?

MEMBER BROWN: No.

CHAIRMAN CORRADINI: Ron?

MEMBER BALLINGER: No.

CHAIRMAN CORRADINI: Okay. So from my perspective I wanted to thank STP, NINA, I'm sorry, I

keep on saying STP, NINA for their presentations. And actually trying to go back and reconstruct some of what we were asking of them relative to the open items for the 2.5. And also thank the staff.

So, from my standpoint, I think the only thing that we need clarification on is the methodology that NINA used to generate their, and I'll give the wrong plot, but essentially their GMRS relative to the expectation that the uncertainty would broaden with frequency and acceleration. And they don't appear to be.

And then generally, or more generically, the staff is going to go back for NUREG-2115, and try to explain to us how those were generated. So we're in understanding as to why they are what they are. Other than that, I think all the previous open items have been closed.

I will remind the members that we sent out an internal memo, since having inherited this. I wanted to at least get everybody on the same page as to the history here. Because we go back essentially five years in all of this activity. And so I put a memo out to you all, just so you have it.

And these last three that we discussed,

relative to 96 on the growth faults, 97 on the seismicity, and 106 on the dam failures, were just the last set of those that we wanted to make sure we're up to speed. Other than that, I want to check with Maitri and Scott. We have a planned meeting in September --

MS. BANERJEE: On the third.

CHAIRMAN CORRADINI: -- which is the first week of September, right, just before the full committee meeting, where we'll take up the last Fukushima, right?

MR. HEAD: I believe so.

MS. BANERJEE: Fukushima 4.2, mitigating strategies.

MR. HEAD: Right. That will be mitigating strategies.

MS. BANERJEE: Yes.

MR. HEAD: We'll focus on that.

MS. BANERJEE: That's September 3rd.

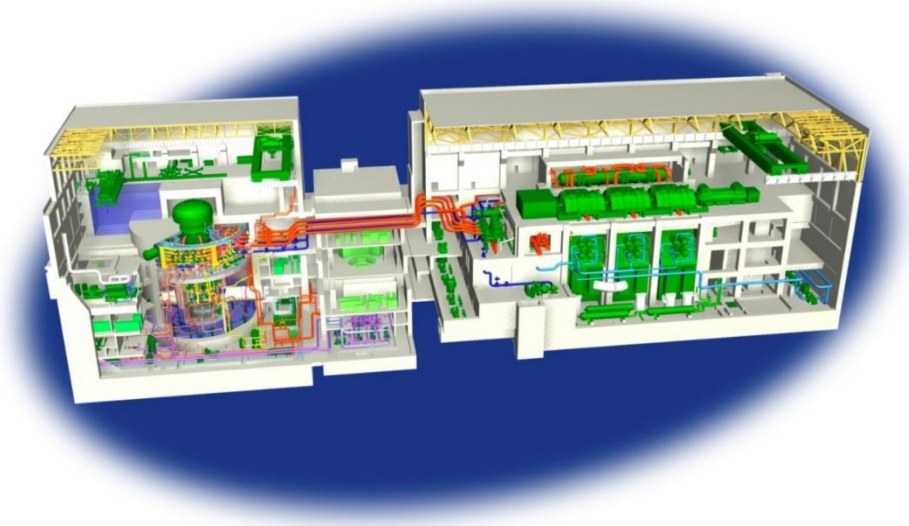
CHAIRMAN CORRADINI: And other than that, are there any other comments by anybody?. Thanks to all. Thanks to NINA. Thanks to the staff. And we're adjourned. Enjoy your lunch.

(Whereupon, the meeting in the above-entitled matter was adjourned at 11:37 a.m.)

# 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

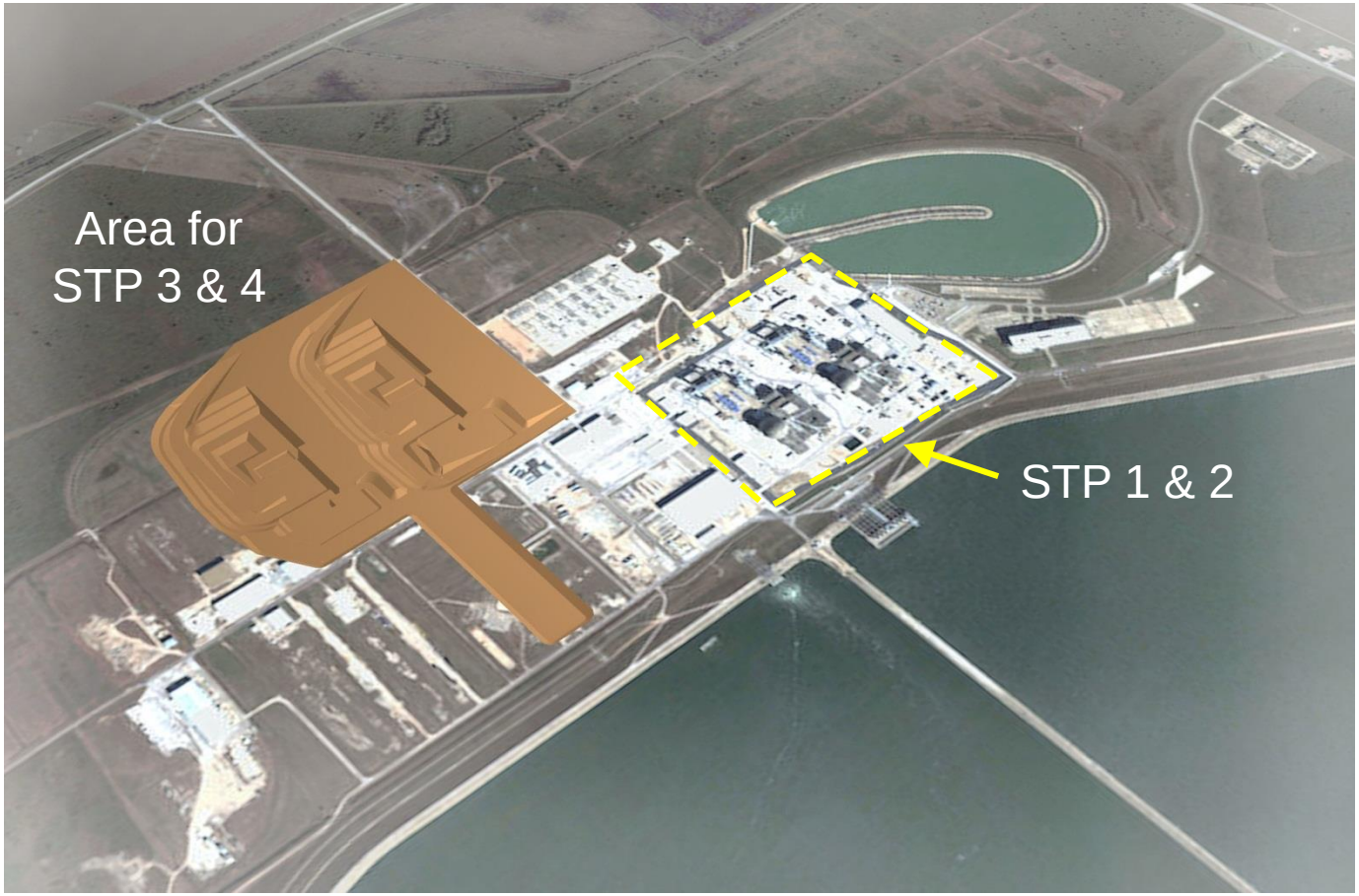
| | |
|---|---|
| Scott Head | Manager, Regulatory Affairs, NINA |
| Dick Bense | Engineer, Regulatory Affairs, NINA |
| Dick Scheide | Regulatory Affairs, NINA |
| Brian McDonald | Exponent Engineering and Scientific Consulting |
| Joe Litehiser | Bechtel Power Corporation |

# 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

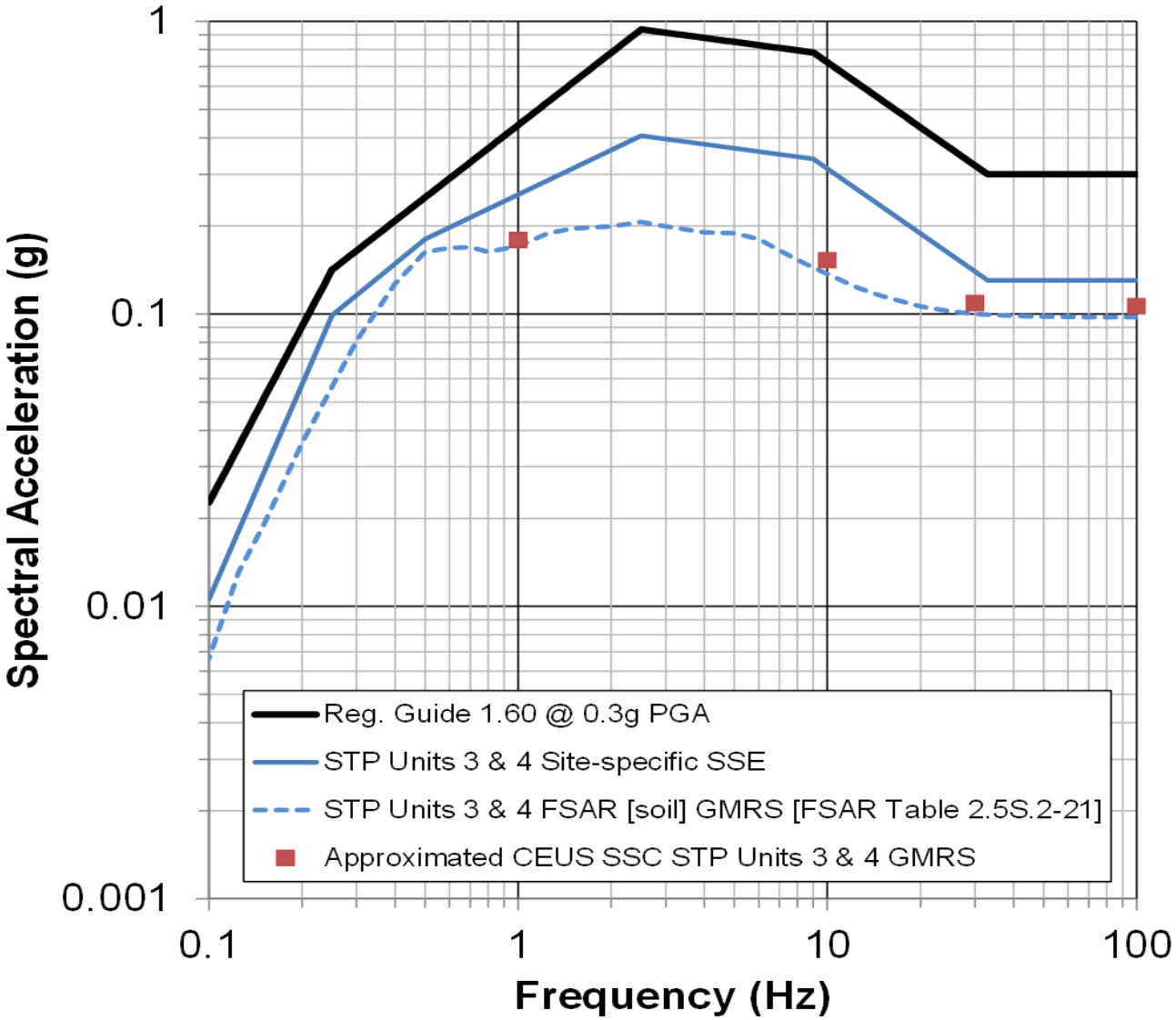
COLA Part 9, Inspections, Tests, Analyses, Acceptance Criteria, Table 3.0-11, Backfill Under Seismic Category I Structures, establishes three ITAAC for Backfill:

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

U.S.NRC

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.

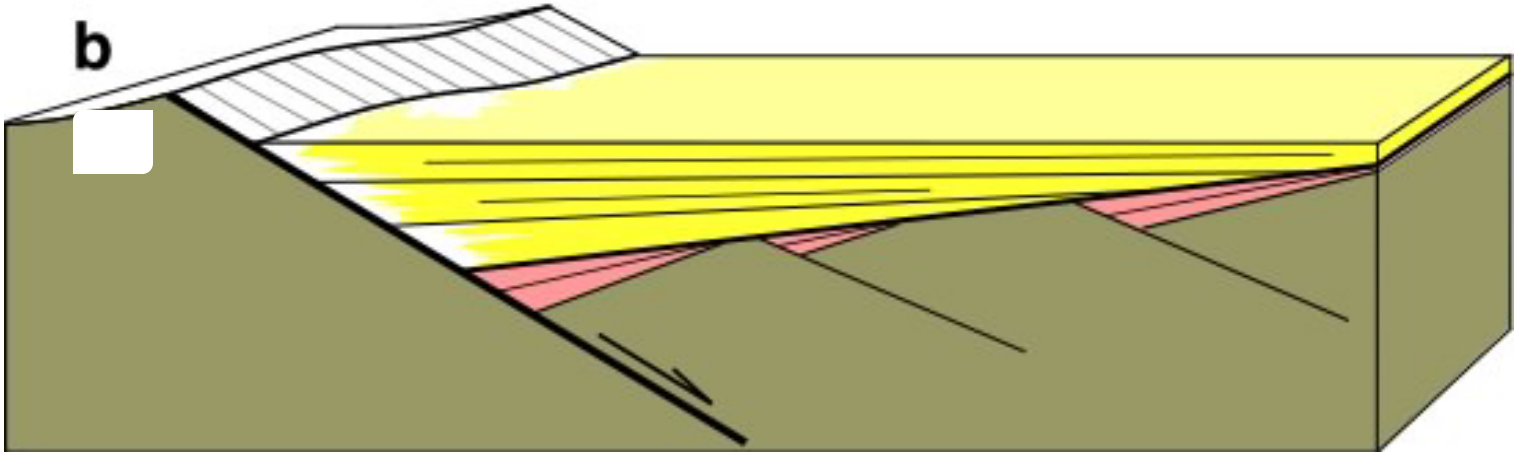
- The applicant updated revision 4 of the STP COL FSAR. The applicant provided a description of its plans for geologic mapping during safety related excavations.

# 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

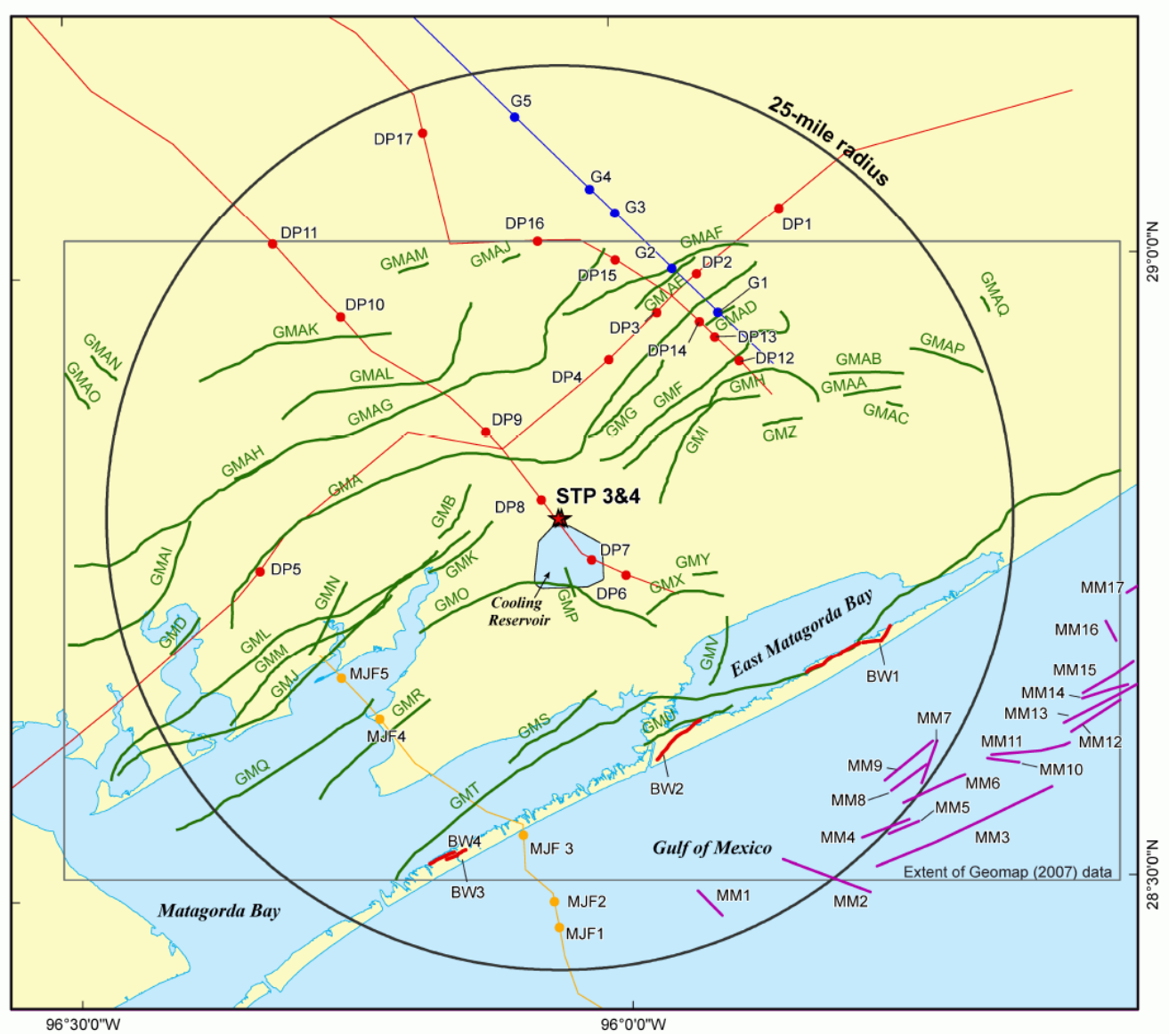
- Based on Units 1 and 2 studies, the applicant evaluated recent growth fault studies in the area and used data from boreholes, aerial and field reconnaissance, geodetic survey to characterize these faults. But no new shallow seismic reflection lines were deployed
  - Even the latest shallow reflection 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

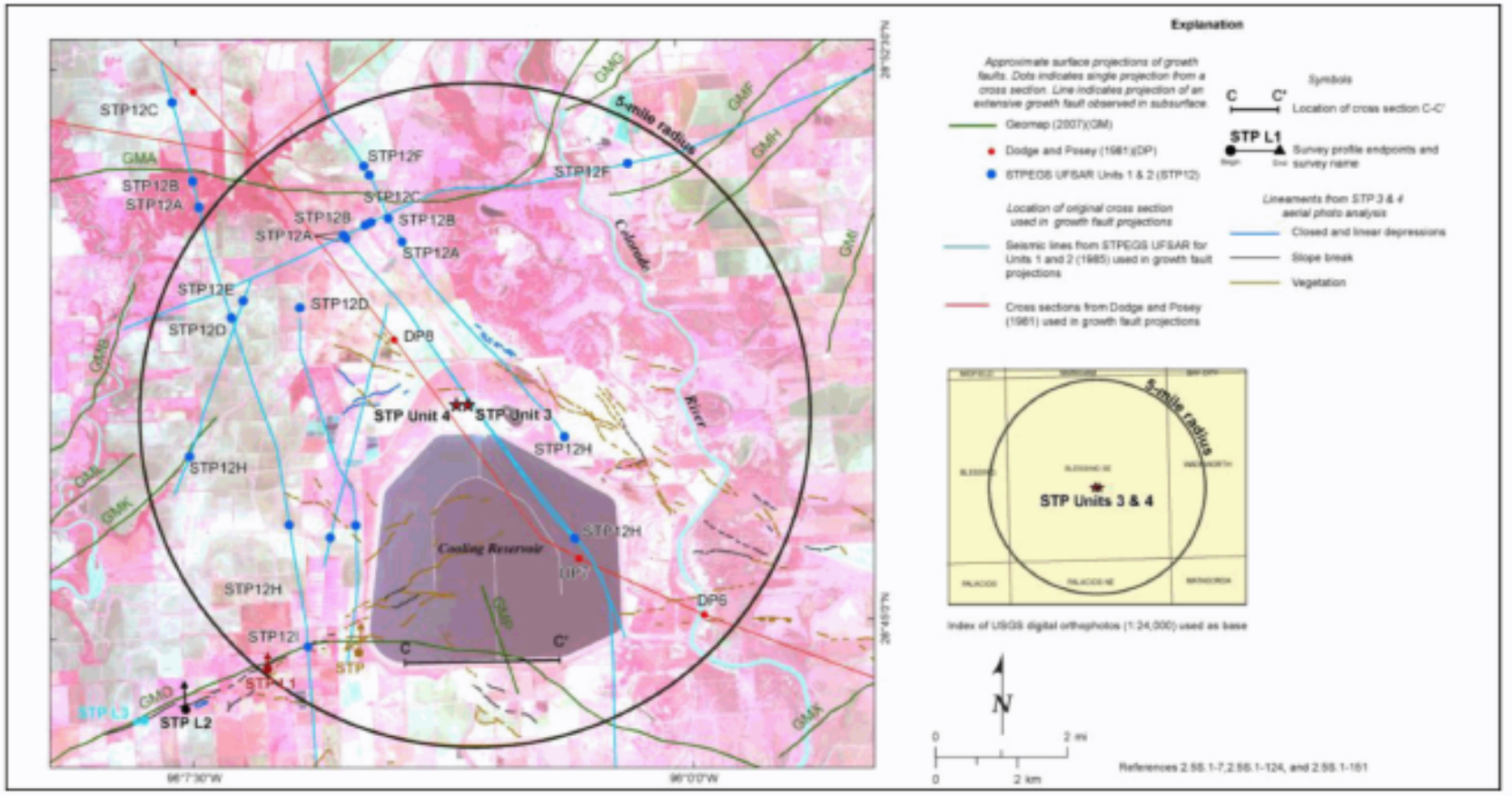
- "There is *prima facie* evidence for localized, low relief titling of the upper surface of the Beaumont Formation above growth fault Matagorda GMO/STP12I, just within the site area (5 miles radius) yet outside the site (0.6 mile radius). The deformation is characterized by south-down monoclinal flexure 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

ACRS Action item #96

# Regional Growth Fault

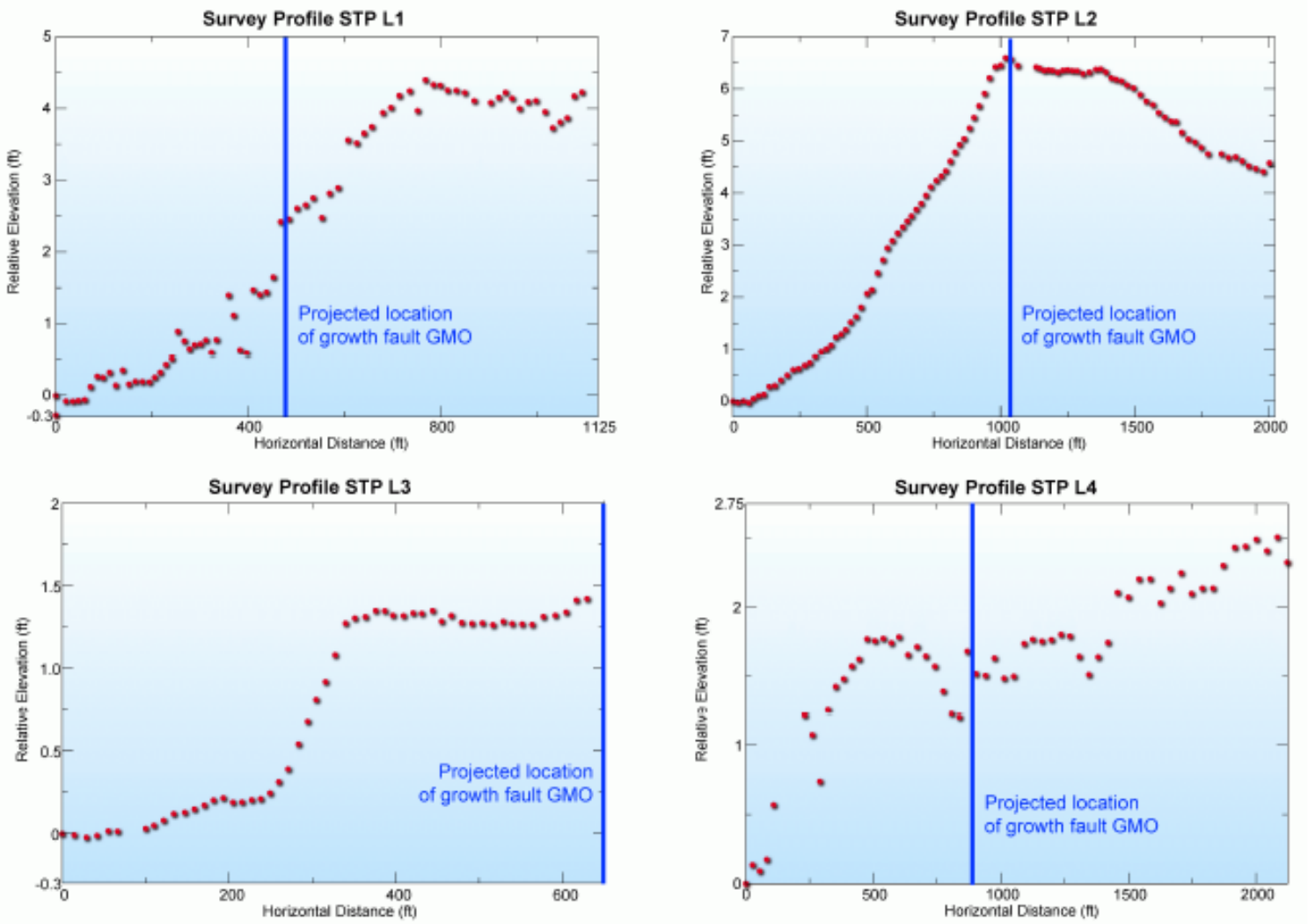


# Growth Fault near STP site



ACRS Action item #96

# Surface Deformation



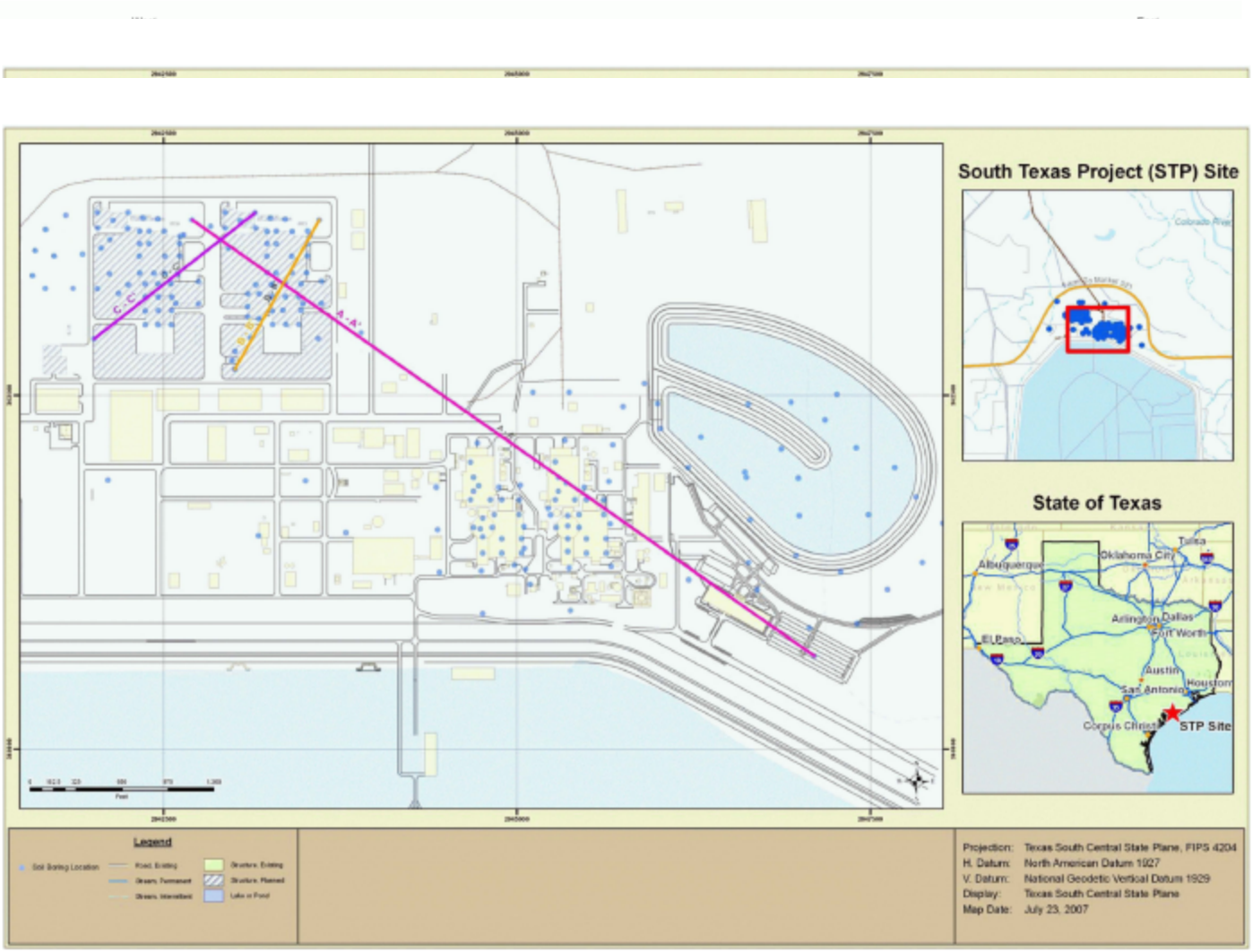
# For Safety Related SSCs

- 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

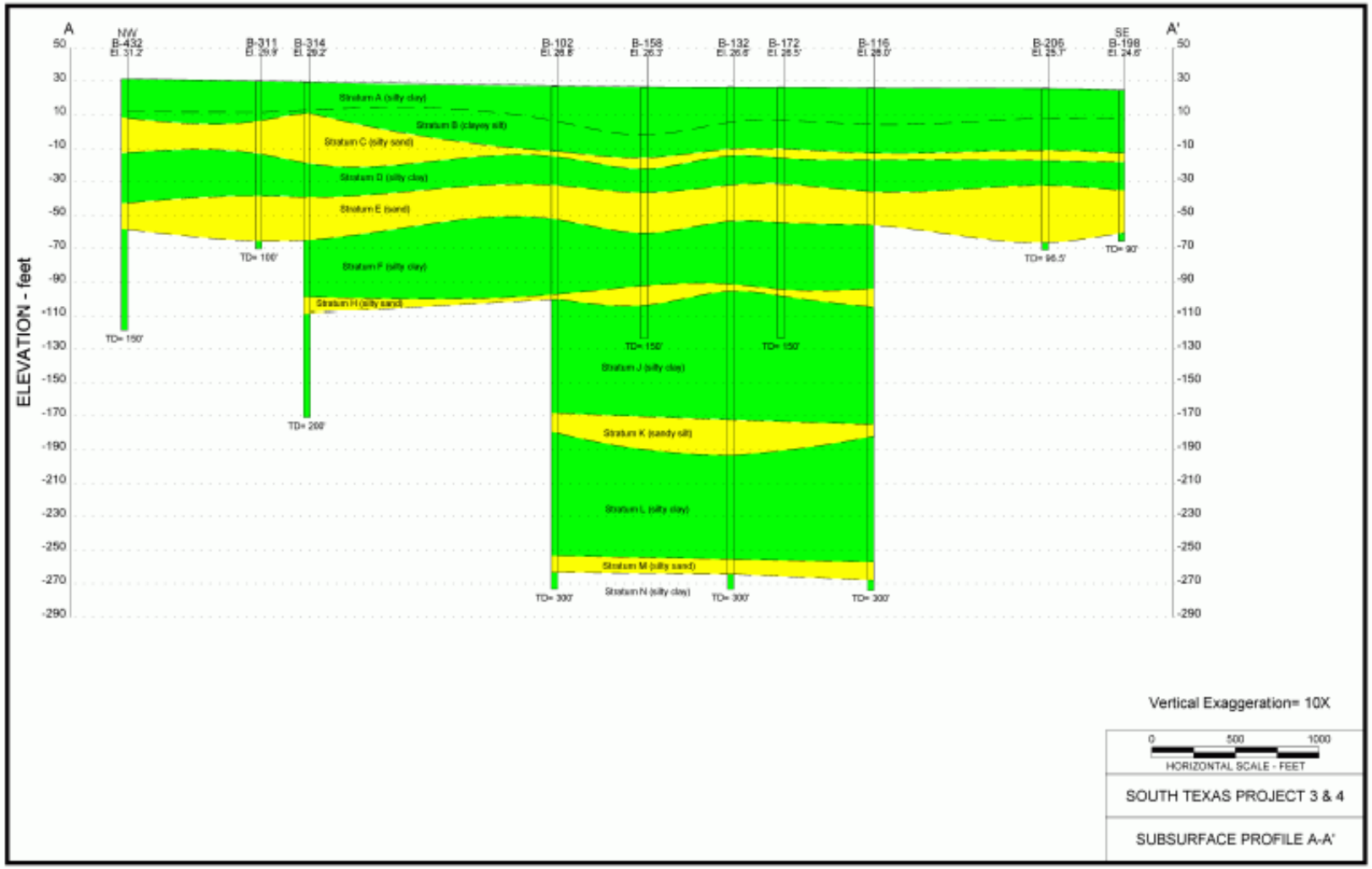
ACRS Action item #96

# Stratigraphic Profile (a-a[1])Location at Site

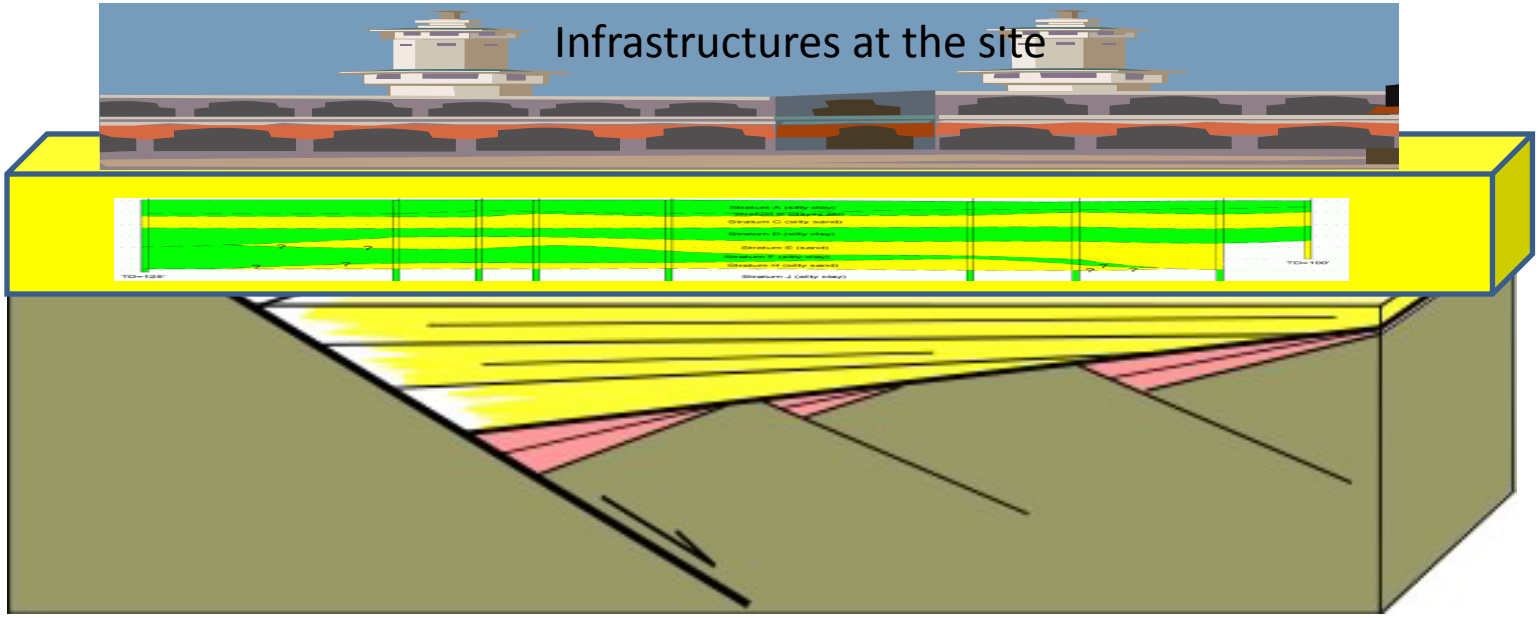




# Continuation of Subsurface Strata



# 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

| Test | Minimum No. of Tests | Criterion for Acceptance Unless Approved by Engineer of Record |
|---|---|---|
| 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 ≥120 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 | $\phi' \geq 30°$ |
| 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 |
|---|---|---|
| 3. The engineering properties of backfill to be used under Seismic Category I structures bound the values used in the site-specific design analyses. | 3. Laboratory tests, field measurements and analyses of engineering properties of the backfill will be performed.<br><br>These tests will include:<br><br>**Test:**<br>Grain Size Distribution<br>**Frequency:**<br>1 per material type per borrow source<br><br>**Test:**<br>Specific Gravity<br>**Frequency:**<br>1 per material type per borrow source<br><br>**Test:**<br>Modified Proctor<br>**Frequency:**<br>1 per material type per borrow source<br><br>**Test:**<br>Drained Triaxial Shear<br>**Frequency:**<br>1 per material type per borrow source<br><br>**Test:**<br>Consolidation<br>**Frequency:**<br>1 per material type per borrow source<br><br>**Test:**<br>Resonant Column/Torsional Shear<br>**Frequency:**<br>1 per material type per borrow source | 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. |

Back Up Slide (Section 2.5.4)

**Table 2.5S.4.5.3-1 Quality Control Recommendations for Structural Fill**

| Material | Test | Minimum Sampling and Testing Frequency[1] |
|---|---|---|
| Structural Fill | Field Density | 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.<br><br>Elsewhere: Minimum 1 sample per 500 cubic yards placed, sample taken at suspect areas, and at least one per every lift. |
| | Moisture | One test for each Field Density test |
| | Moisture-Density Relationship (Modified Proctor) | One test for every borrow area and material type and any time material type changes.<br>Additional test for every 10 Field Density test (ASTM D1557) |
| | 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. |

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# 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

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# 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

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# 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)

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# 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

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# 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

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# 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.

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# 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?

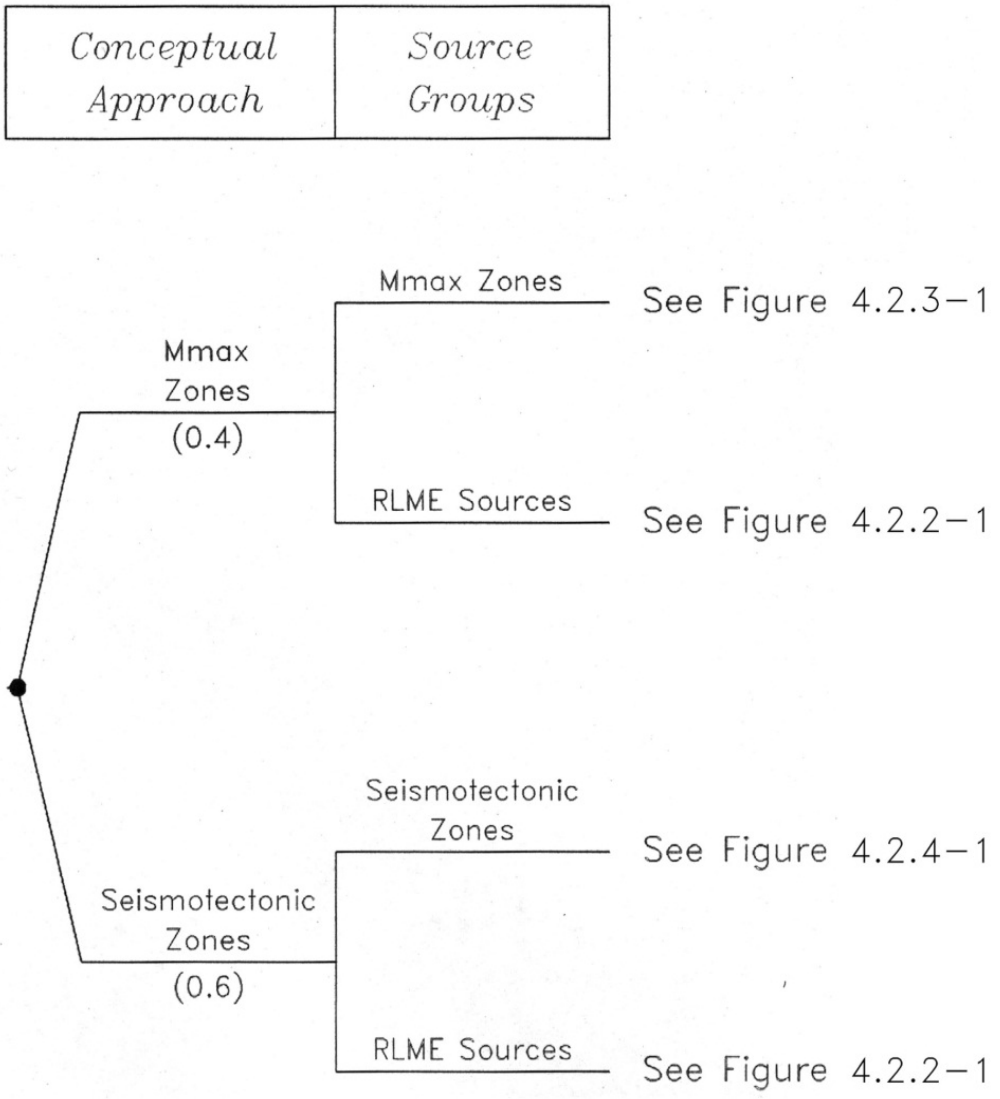
- NRC issued RAI 01.05-1 in May, 2012 , which addressed Recommendation 2.1 of the Fukushima Near-Term Task Force recommendations:
  a) Evaluate the potential impacts of the Central and Eastern United States Seismic Source Characterization (CEUS-SSC) model (NUREG-2115) on the seismic hazard
  b) Modify 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

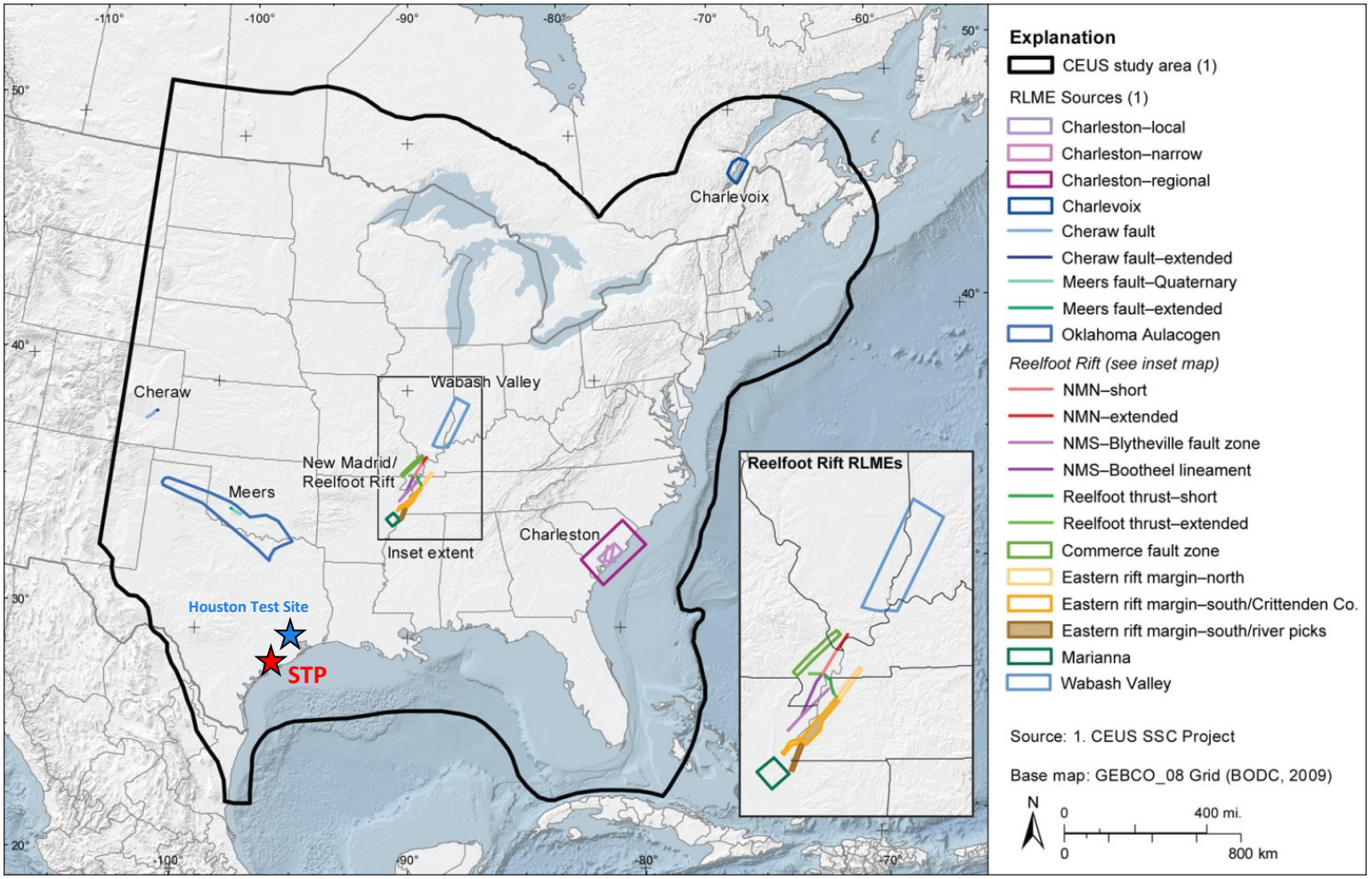
Three types of seismic sources models:

- Mmax Zones
- Seismotectonic Zones
- Repeated Large Magnitude Earthquake (RLME) Sources



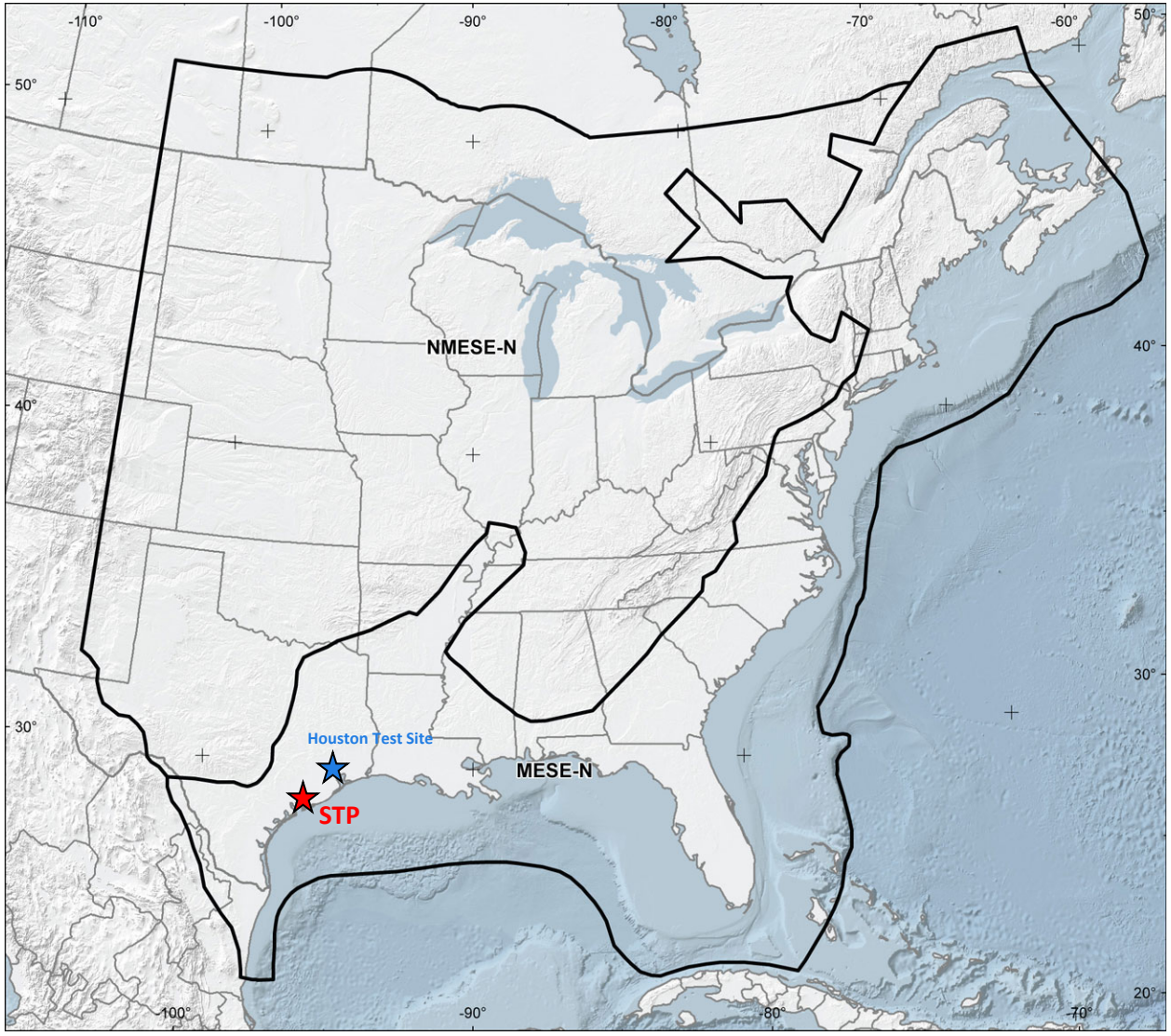

CEUS-SSC Master Logic Tree (Taken from Figure 4.2.1-1 of NUREG-2115)

# CEUS-SSC Model Summary (Cont'd)



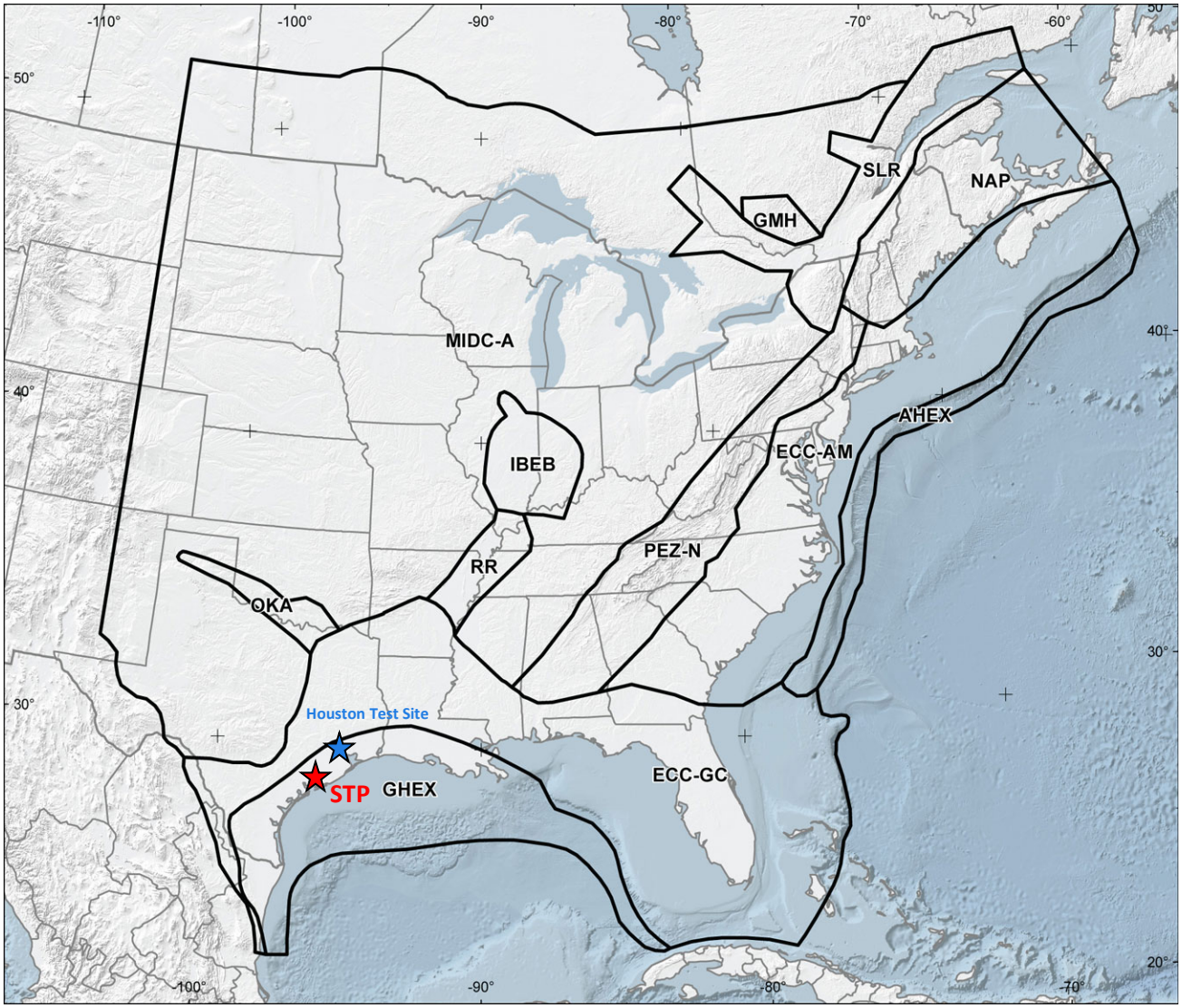

Repeated Large Magnitude Earthquake (RLME) Sources are defined as having had two or more earthquakes with **M** ≥ 6.5.

# 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)

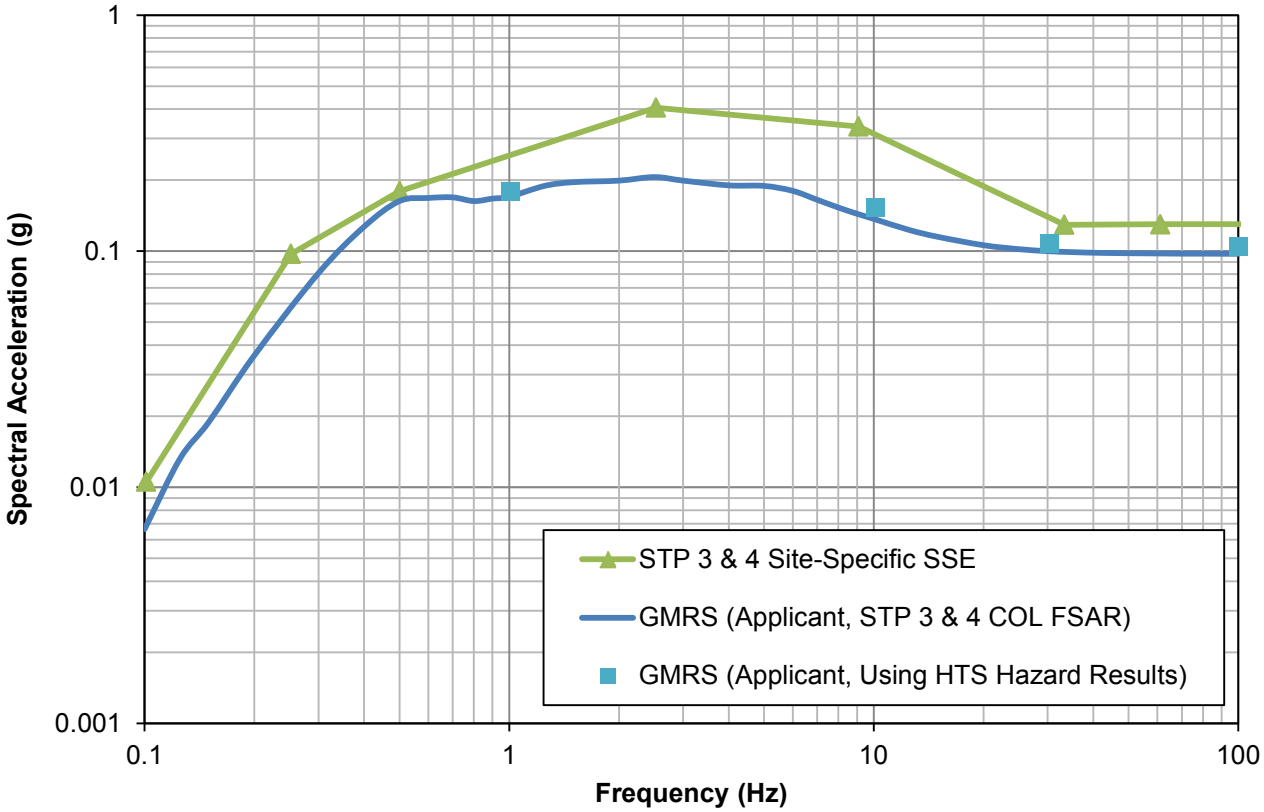



Seismotectonic zones are based on historical seismicity and regional-scale geologic and tectonic data to characterize seismic sources zones at a finer scale than the Mmax zones model.

# 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)

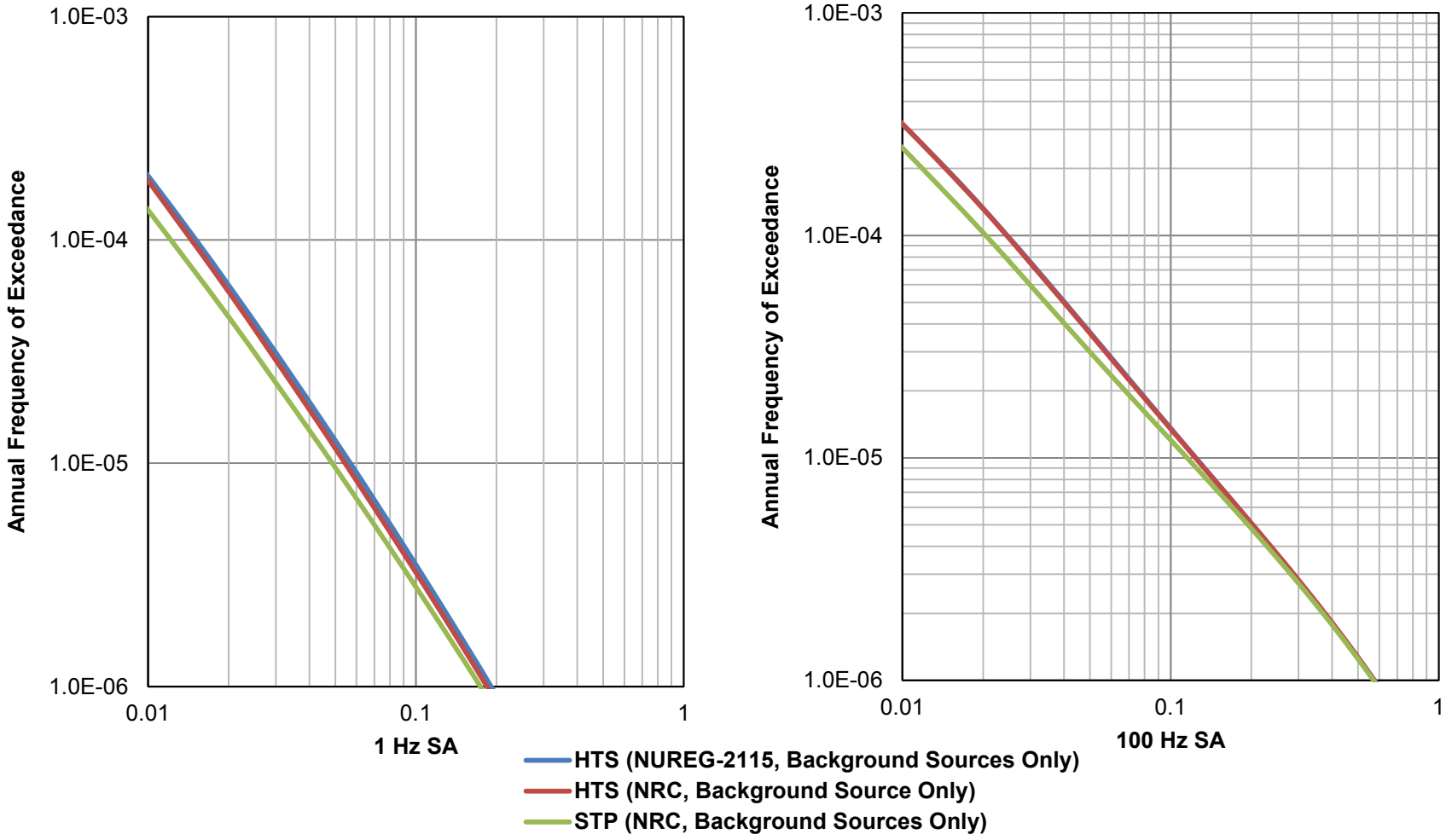



- Applicant concluded that STP COL application GMRS did not need to be revised:
  - The CEUS-SSC STP GMRS (blue squares) is very close to, and not significantly above, the STP COL application GMRS (blue curve), while the site-specific SSE (green curve) envelopes both

# 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

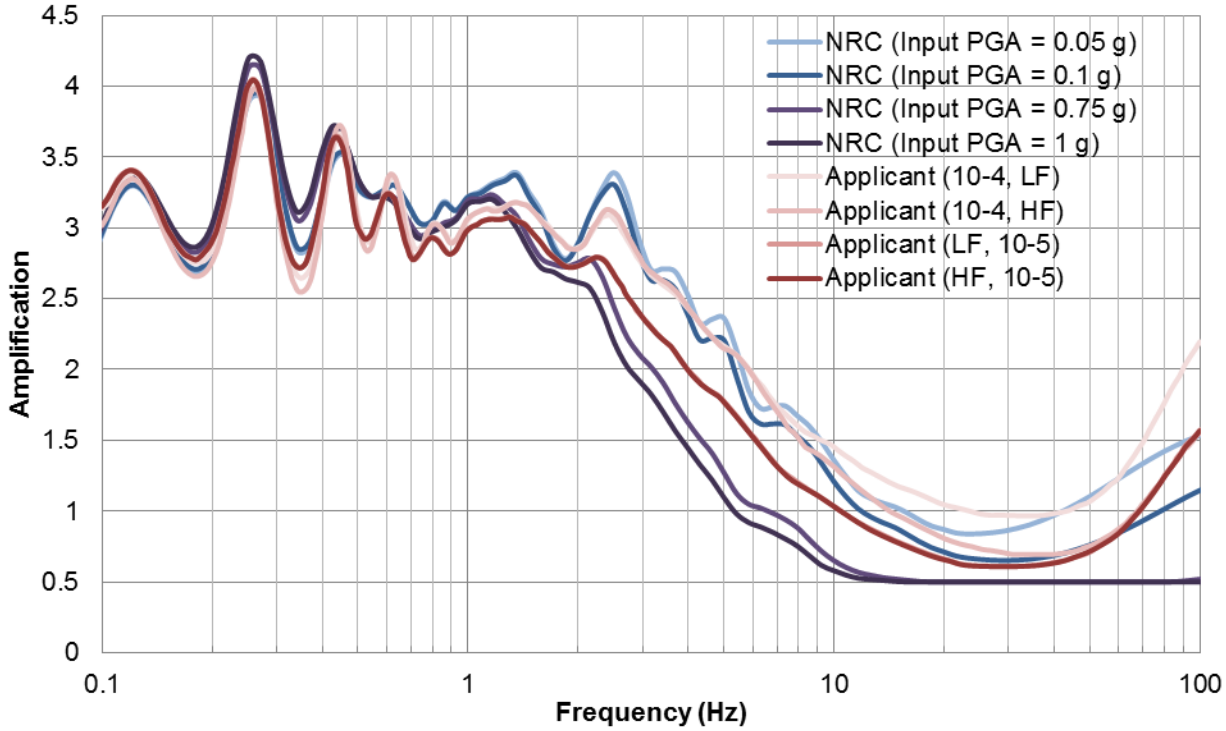
# Summary of the Staff's Review (Cont'd)



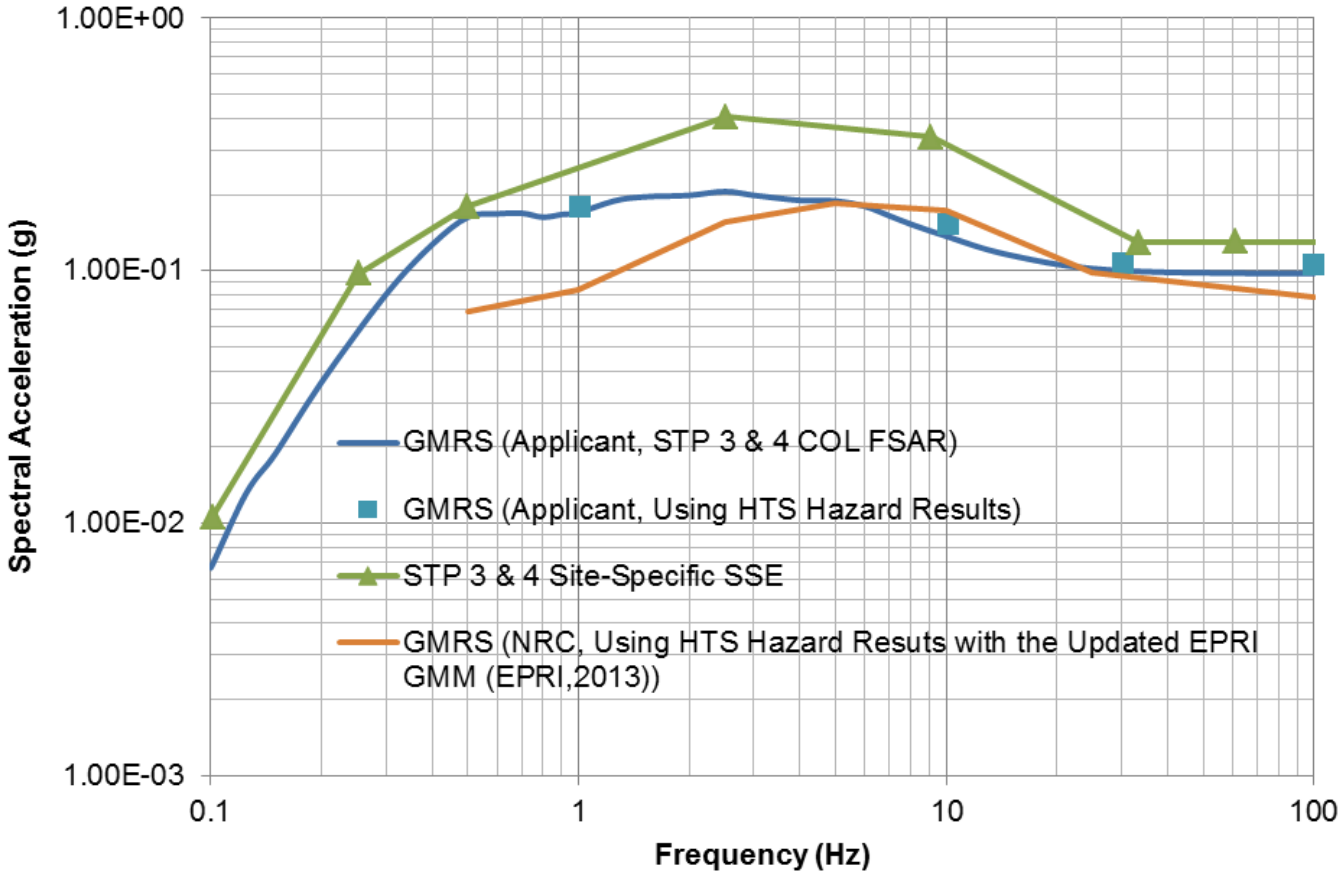

- Staff concluded that the COL applicant's use of NUREG-2115 hazard curves for the Houston Test Site for 1 Hz, 10 Hz, and 100 Hz, an adequate substitute for performing hazard calculations at the STP site using the CEUS-SSC model.

# 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

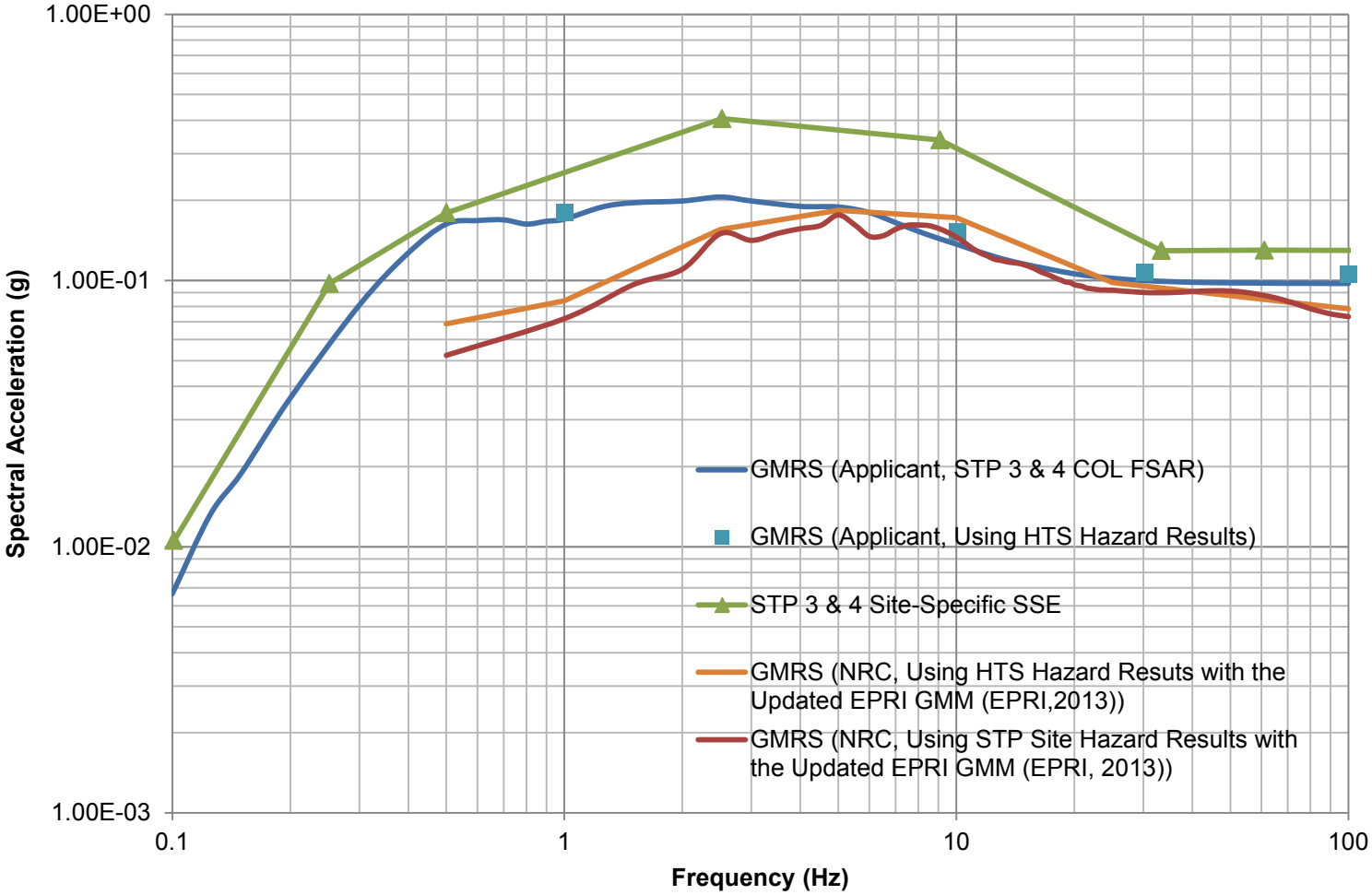


# Summary of the Staff's Review (Cont'd)




- 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**

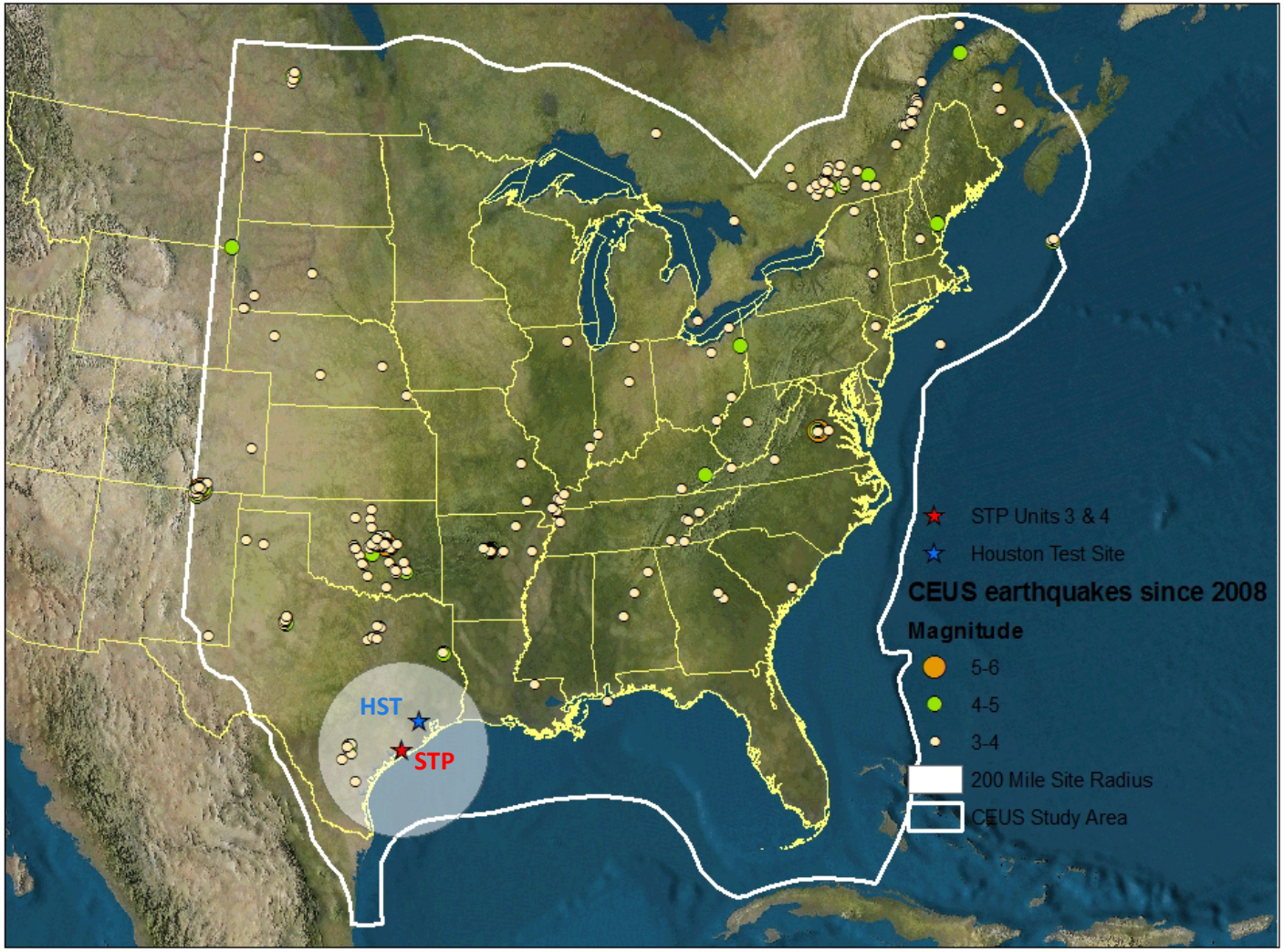
*Discussion/Committee Questions*

**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.

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# 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

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# 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.

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# 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)

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# 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

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# 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)

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# 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 $1x10^{-6}$ per year, sunny-day failure should be assumed to occur and the consequences estimated. (ISG-2013-01 page 1-9)

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# 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)

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# 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?