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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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U.S. EPR SUBCOMMITTEE

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WEDNESDAY

MAY 8, 2013

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ROCKVILLE, MARYLAND

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

SUBCOMMITTEE MEMBERS:

DANA A. POWERS, Chairman

SANJOY BANERJEE, Member

MICHAEL T. RYAN, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

NRC STAFF PRESENT:

KATHY WEAVER, Designated Federal Official
SURINDER ARORA
DAN BARSS
TANYA FORD
DIANE JACKSON
REBECCA KARAS
MARK LINTZ
MICHAEL MIERNICKI
DOGAN SEBER
ALICE STIEVE
WEIJUN WANG

ALSO PRESENT:

ANTONIO FERNANDEZ, UniStar
MARK FINLEY, UniStar
MARK HUNTER, UniStar
WAYNE MASSIE, UniStar
SCOTT McCAIN, UniStar
TODD OSWALD, AREVA NP
SHANKAR RAO, Bechtel
MICHAEL ROSENMEIER, Rizzo Associates
DOUGLAS SCHWEERS, UniStar
ONUR TASTAN, Rizzo Associates

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

(8:28 a.m.)

CHAIR POWERS: This meeting will now come to order. This is the first day of a two day meeting of the Advisory Committee on Reactor Safeguards, U.S. EPR Subcommittee.

I am Dan Powers, Chairman of the Subcommittee. ACRS members in attendance are Steve Schultz, Dick Skillman, John Stetkar, Michael Ryan will join us after 11:00 o'clock. And Professor Sanjoy Banerjee will be in here episodically as his expertise is demanded here and elsewhere.

Our purpose of this two day meeting is to continue our review of the Safety Evaluation Report with open items for the combined license application submitted by UniStar Energy for the Calvert Cliffs Nuclear Plant, Unit 3.

We will hear presentations and discuss portions of Chapter 2, Site Characteristics. And including Section 2.5, Geology, Seismology and Geotechnical Engineering.

We'll also look at Chapter 13, Conduct of Operations. The Subcommittee will hear presentations by and hold discussions with representatives of UniStar, the NRC staff and other interested parties.

The Subcommittee will gather information and plans to take results of these reviews, along with other reviews by the Subcommittee, to the Full Committee meeting at a future Full Committee meeting.

Now, my intention, or my aspiration, is that we will try to complete this phase of the review no later than October of this year so that we can produce a letter and close out Phase 3. That's my aspiration and I certainly hope that we can work to that, because Mr. Armijo is putting some pressure on us to show productivity in the face of sequestration and things like that.

So to the extent that we can I'd like to try to wrap this up, Phase 3, up no later than October. That means probably the final Subcommittee meeting might be in September and then a Full Committee presentation in October.

Rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register.

There is a bridge line established in the meeting room for members of the public. It is now set on listen in only mode and if I am reminded I will call for comments on that bridge line at appropriate times.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice. Therefore, we request that participants in the meeting use the microphones located throughout the meeting room when addressing the Subcommittee.

Participants should first identify themselves and speak with sufficient clarity and volume so they may be readily heard.

Copies of the meeting agenda and the handouts are available in the back of the room.

Do any of the members have opening statements they would like to make?

In that case I am going to turn the meeting over to Surinder Arora, the NRC Project Manager to give us some opening comments.

MR. ARORA: Thank you, Dr. Powers. Good morning. My name is Surinder Arora and I'm the lead project manager for the Calvert Cliffs, Unit 3 Combined License Application Review Project.

We are here today to make presentations to the Subcommittee for Chapter 2, Section 2.5, which is "Geology, Seismology and Geotechnical Engineering." And Chapter 13, titled "Conduct of Operations."

The order of the presentation is depicted on the slide that's currently being displayed. First of all I'll provide a brief overview of the status of the project and I will only touch upon the progress that we have made from the last meeting we had in January, until date.

And after my presentation we'll start Chapter 2 presentations with UniStar's presentation, of course. And then the staff presentation.

The staff presentation for Chapter 2 will be handled by the person on my left, Tanya Ford. She is the chapter PM for Chapter 2.

And upon completion of Chapter 2 presentation we will start presenting Chapter 13, whenever that happens in the afternoon. And we expect that maybe we'll be done today, Dr. Powers, if --

CHAIR POWERS: Yes, we'll kind of play that by ear as we get to the timing. We have some time scheduled for tomorrow. But if we can wrap it up today I think we'd all be happy.

MR. ARORA: And basically we'll follow this presentation order.

My next slide here is a milestones chronology. Basically it lists when the various revisions of the applications were submitted by UniStar. And we are currently on Revision 9 of the application which was received by the Commission on 04-09-2013.

And the last row here tell us which chapters have already been gone through this review process, up to Phase 3. And basically, if we can skip the next slide and go to Number 5, I wanted to show what we are left with so that I can tell you about Phase 2 completion.

We are only left with Chapter 2, Section 2.4, which is the Hydrology part of the chapter. And Chapter 9, which is currently being worked on.

So our plan is to bring that to ACRS some time late September or early October. That's how it looks like today.

CHAIR POWERS: It would certainly be nice if we could certainly not exceed that schedule.

MR. ARORA: And we will try to expedite, Dr. Powers.

CHAIR POWERS: To the extent that we can expedite in the phase, the hydrologic engineering is a problem because I think you use contractor forces in that area.

MR. ARORA: Yes, we do.

CHAIR POWERS: And contracting in sequestered times is difficult. So we may want to revisit our definition of open item here a little bit and see if we can't --

MR. ARORA: Now most of the RAIs have been responded to. So it's staff's activity that's left.

CHAIR POWERS: Okay. Well we'll maintain a dialogue over the coming months.

MR. ARORA: Sure. We'll be keeping you posted on the progress that we make.

CHAIR POWERS: I would really like to get things so that October or November, at the latest, we can put out a letter that says we're done with these three.

MR. ARORA: Yes.

CHAIR POWERS: So that we, you know, we got some progress. A notice of progress. This is not the last time we take the bite in the apple here. So we can certainly come back and reexamine issues.

MR. ARORA: We'll certainly look.

CHAIR POWERS: But it would be nice if we could move right along here.

MR. ARORA: Can you go to the previous slide?

MEMBER SKILLMAN: Let me ask a question, please.

MR. ARORA: Sure.

MEMBER SKILLMAN: With Chapter 6 behind us and 8 behind us, that's ECCS and Electrical, why is 9 so delayed? What is going on with Chapter 9?

MR. ARORA: Oh, we had some changes in the design and we just got some last set of RAI responses 4-30.

MEMBER SKILLMAN: Thank you.

MR. ARORA: Well, staff just got them.

MEMBER SKILLMAN: So you're saying there were some changes?

MR. ARORA: It's just the diameter.

MEMBER SKILLMAN: Okay, thank you.

CHAIR POWERS: So this is, there is no question this is a fairly dynamic process. And it's one we agreed to at the outset. And I have no troubles with the way it's worked. I think it's worked far better than I thought it was. But you did have to put up with this fact that it is a little more dynamic and you're seeing things on the run.

But that's, so far, been okay. And it's been okay because staff's been fairly disciplined in what they bring to us, and I very much appreciate that.

MR. ARORA: Thank you.

CHAIR POWERS: And of course I appreciate as well what the applicant has been doing. But it is fairly dynamic but I think it's useful for us if we can just mark some milestones here to keep the rest of the world of where we stand and whatnot.

MR. ARORA: Go to the previous slide.

CHAIR POWERS: Let me just say publicly that Surinder has been wonderful and the discipline with which he has exercised in bringing things to the Subcommittee to examine has made our life a lot easier, sir, and we very much appreciate that.

MR. ARORA: Thank you. This slide here shows the six phases of the review process that we followed on Calvert Cliffs application. And we are currently in Phase 2 and 3, with those items that we just discussed. And we should be coming Phase 2 complete after those two items are brought to ACRS.

CHAIR POWERS: Yes. And all I want to do is get Page 3 complete so that, it will open up and we will proceed with, to us Phase 5, to you Phase 4. And look at our strategy for that.

MR. ARORA: And the last slide that I have here is on the information incorporated by reference. I just want to say a few words, some general statements on that.

That according to Part 52, the COLA Applicants can reference sections of the design certification in their application. And since we are doing a concurrent review of the EPR Design Certification Application as well as COLA Application, so there is the possibility as the divisions are made to the design certification we have to re-review our SERs to make sure that we are incorporating everything that's in the latest version of the design certification application.

So in order to do that we have created an open item, which applies to all chapters for Calvert Cliffs application. And that open item will not be closed until we have the final revision from AREVA certifying that their design is final. And we use that and reconcile our SERs, which we have done. And we'll make sure that all the loose ends are tied up.

CHAIR POWERS: Yes, and there can be some substantial evolutions and you just happen to be on the end of the whip here.

MR. ARORA: We have to deal with it as it comes. And that's why we have this Open Item and I just wanted to make sure that --

CHAIR POWERS: Yes, that's an excellent strategy and it helps us a lot.

MR. ARORA: Okay, with that my presentation is complete. And any questions from the Subcommittee on my presentation, I'll be glad to answer those. And if not I will turn the meeting over to Mr. Finley.

CHAIR POWERS: Yes, I would just say we may just pause a little bit after lunch to see where we stand on wrapping things up for the day.

Lay out our agenda a little bit, might not, otherwise we'll proceed as the agenda says right now.

MR. ARORA: Sure.

CHAIR POWERS: Okay, Mark.

(Off the record comments.)

MR. FINLEY: Good morning. Good to be here once again.

CHAIR POWERS: Are you going to lie to us again?

MR. FINLEY: No. Persistent.

CHAIR POWERS: How are we going to take us seriously if you begin the presentation with this, oh it's wonderful to meet with the Subcommittee?

MR. FINLEY: Oh, it is good to be here, Dr. Powers.

As was said earlier this morning UniStar is getting close to the end of Phase 2 and Phase 3, so we look forward to that process and we fully support Dr. Powers' goal of getting done with Phase 3 with the October/November timeframe. I think we can do that.

As Surinder said, most of the questions have been responded to, they're back at the staff. There's one or two issues we're working on Chapter 9 to be finished but I fully think we can be done with that to support the SER in August of this year, the draft SER I should say. And I thank Surinder for his diligence in expediting that process as well.

CHAIR POWERS: We might, give it some thought today for what kinds of presentations we'd want to make to the Full Committee, the magnitude of those. And usually we've done only that which we we're sending on to Phase 4.

So maybe this is the time to do more comprehensive kind of, you know, whenever we're ready to go to the Full Committee, to do something a little more comprehensive.

You know, you guys need to think about that. Because it will be a while before we come back to the Full Committee again as we go through 4 and 5.

So we need to give it some thought on how we want to do things there, because this is, it's an important application for an important design, that it might be useful to stake something in the ground so the Committee remembers what they've -- Give it some thought and I'll certainly take your input on it.

MR. FINLEY: We will certainly support the staff and ACRS Committee on that.

So, as was also said this morning, today we'll talk about Section 2.5 and Chapter 13. We hope to be finished today and we hope also not to keep you until 8:30 tonight in so doing.

CHAIR POWERS: Why?

MR. FINLEY: I know you love this business but we won't push the limits.

CHAIR POWERS: Oh, it keeps us off the streets at night. And we stay out of the bars and the flesh pits and things like that.

MR. FINLEY: But by the same token we have, we think, the right experts here to answer any and all of your questions on Section 2.5 and Chapter 13 this afternoon. So obviously, as you always do, feel free to ask whatever questions you have.

CHAIR POWERS: I am dying for a speaker to come up here and say don't ask me any questions because I'm not going to respond anyway.

MR. FINLEY: Maybe by way of preamble, just a bit on Section 2.5 in particular, one of the reasons from a timing standpoint we're here fairly late in the game on this section is that two years ago, roughly, a little less than two years ago, shortly after the near-term task force report came out on Fukushima, UniStar made the decision to incorporate the updated seismic information from the Central Eastern U.S. report that at the time was not available, it was still being worked by NRC, EPRI and DOE.

But we made the decision then in response to Fukushima to do the right thing and incorporate the updated seismic data. I will also say we did have a window of opportunity that was available, essentially, last year and this year to incorporate that updated seismic input. Because at the same time in parallel ARIVA and UniStar were working on updating the structural models and methodology so we weren't quite ready to run the site-specific reconciliation cases for the structures.

So we had a window of opportunity to incorporate the updated seismic information. So we took that window of opportunity and that caused us to resubmit, essentially, a revised Section 2.5 roughly September/October of last year and we've been working with the staff since that time to answer questions. And I think we're just about there.

So from a schedule standpoint that's why we're here, but I also think we did the right thing in terms of incorporating the updated seismic information.

CHAIR POWERS: That, by the way, is one of the things that you want to highlight in a presentation to the Full Committee.

MR. FINLEY: Certainly.

CHAIR POWERS: That's something that will have a breadth of interest, because they're struggling with what all this new seismic information means.

MR. FINLEY: We think it was the right thing to do. We think incorporating this updated seismic input into our design, essentially, and not doing an evaluation, a qualitative sort of evaluation was the right way to go.

We also experience, in the interim, an earthquake as you know in Mineral, Virginia and so we're prepared to talk some about that today, that actually, and Antonio will talk about this, didn't get explicitly incorporated into the EPR/NRC/DOE, CEUS Report. However, there's been some significant work done by UniStar and others in the industry in terms of what the effect of that earthquake was on the CEUS information.

CHAIR POWERS: Very good.

MR. FINLEY: So we're also prepared to discuss that some today.

CHAIR POWERS: Again, that will be something of broad interest.

MR. FINLEY: Okay, so by way of introduction we use the incorporate by reference methodology, as you know. We'll provide supplemental information today and of course for Section 2.5 there's a significant amount of that because it all relates to site-specific information at Calvert Cliffs essentially.

The AREVA U.S. EPR ACRS meeting for Chapter 2 was back in November of 2009, so it's a while ago that you saw the EPR for this section.

Slide 3. There are two departures and two related exemptions that we will discuss that relate to Chapter 2.5. There are no ASLB contentions. And there are 11 COL Information items that we'll talk about in our presentation.

And Slide 4. So, again, by way of introduction, Mark Finley is my name. And for the record I've been with UniStar since 2007 and before that with Constellation and Baltimore Gas and Electric at the Calvert Cliffs plant since 1984. And before that with the U.S. Navy for seven years.

I'm assisted in today's presentation by Antonio Fernandez. He is a member of the UniStar team. He is not a seismologist or a geotech specialist, but he is our civil structural manager. And he'll be supported by those in the cast here from Rizzo, ARIVA and Bechtel, Onur Rastan, Shankar Rao and Todd Oswald from those companies that are supporting us with the work for UniStar.

And again, we'll focus on site-specific information for 2.5. And with that I'm going to turn it over to Antonio Fernandez who's much better able to answer your questions than I.

MR. FERNANDEZ: Okay, thank you, Mark. And thank you to the ACRS Committee. My name is Antonio Fernandez, I'm with UniStar engineering. And I followed closely these projects, they are near to me. Site investigation that has occurred since 2006. And my goal today here is to be able to communicate the story of this site to you.

There's a few things in the application that are going to get more site-specific than the geotechnical and the geologic, geophysical seismic investigation so we'll try to convey what are those site-specific issues that matter the most.

So getting started with Section 2.5, "Geology, Seismology and Geotechnical Engineering." The presentation is organized, it identifies all items identified by the U.S. EPR and provides written descriptions of the activities and tasks, efforts that UniStar has performed in order to respond to those COL items and to fulfill the requirements of the U.S. EPR.

So we start with the need to form a

comprehensive geologic/geotechnical/geophysical investigation. And this is done, we can say it's done at different levels of resolution.

We started with what's called a site region, that's a 200 mile region around the site. The level of study there is related to heavy literature research, updating the latest publications, the latest information retarding geology, tectonic features.

As we get closer to the site we talk about the site vicinity, which is a 25 mile radius. Now we're starting to get a little closer to the site, getting boots on the ground and refining the investigation. Putting more attention into the tectonic or potential for surface faulting.

Then we get closer to the site, site area and site radius, which ends up with the geotechnical investigation, the execution of boring logs and field tests and laboratory tests.

MEMBER SKILLMAN: Question please. Two hundred miles to the east of this proposed site, you're off the Atlantic Shelf.

MR. FERNANDEZ: Sure.

MEMBER SKILLMAN: So how do you incorporate the maritime influence on the shelf, or the plate of land on which this site is located?

MR. FERNANDEZ: Well, yes there's 200 mile radius, yes it goes to the ocean of course. One we do have is that we are capable of recording seismicity that originates offshore. So that's one thing that works in our favor regardless of when an earthquake happens offshore.

So there's level of information about the tectonic nature, even on offshore locations, even though we can't map surface faulting or we can't have satellite imagery, there's still instrumentation that helps in assessing what is the potential hazard that can originate from that portion.

As far as are there limitations? Of course there are limitations. But the seismicity, even in the offshore locations, is well defined.

MEMBER SKILLMAN: Thank you.

MR. FERNANDEZ: Okay, so moving along. Slide 8. This investigation has been performed following guidance from the staff, particular the documents showing here.

Reg Guide 1.206, Section 2.5.1. And Section 2.5 for the geologic/geotechnical investigation. Particular emphasis in Regulatory Guide 1.208, which defines the performance approach to obtain the site-specific earthquake design basis.

So these are the main regulatory framework documents that guides us to the process of getting what are going to be the seismic loads for the site.

So here's an example of site vicinity, this is a 25 mile radius showing some of the tertiary features. These are, we can think of them as a little older age, inactive non-capable sources. And we're showing here the round dots that you can see in the screen showing the recent seismicity.

After the catalogs, available catalogs we have, there's some updates that we have to perform to the COLA Section 2.5 in response to the occurrence of the occurrence of the Mineral, Virginia earthquake. And those are being tracked, actually they're being tracked as an open item by the staff through RAI 385.

Here's an example, next slide, of site region, 200 mile region. And one thing that we can point out on this slide, and I'm going to use the pointer here, to indicate this cluster of seismicity, that's the Central Virginia Seismic Zone.

This slide's showing other features, other tectonic features, in the region. And of all these features the only one that's classified as a capable source is the Central Virginia Seismic Zone.

All of the other faults and alignments shown in this slide are currently classified as non-capable sources even though they're Quaternary Age features.

Moving on. So one of the main goals of this investigation is, I think I mentioned, is to get the site-specific earthquake design basis.

CHAIR POWERS: If I can just ask a question.

MR. FERNANDEZ: Sure.

CHAIR POWERS: You have the 17 seismic features that are identified in here.

MR. FERNANDEZ: Yes.

CHAIR POWERS: Sixteen of them are not deemed as capable, what does that mean?

MR. FERNANDEZ: They don't have any evidence of activity over the recent period. And when I mean recent is a long time in terms of geologic activity.

CHAIR POWERS: Yes. Well I think that means they can't point to any recent activity. So if, on the other hand, something happened along one of those faults and they suddenly pop over into the capable category it might be a surprise to some people.

MR. FERNANDEZ: Correct.

CHAIR POWERS: Or it might not be very surprising. I mean we have the recent geologic history of the earth seems to be replete with examples of faults not previously identified suddenly emerging. And incapable faults suddenly becoming capable.

MR. FERNANDEZ: True, that's part of the focus of the investigation. To get to the latest information available on these features.

So Slide 11. Again, one of the main objectives is to define the site-specific earthquake design basis and compare it against the seismic design basis that used in the certified designs.

But we want to perform that comparison, of course the U.S. EPR will request that comparison, and we have to see how our seismic design basis measures against the level of ground motion that's used in the design certification.

One of the things I think, and Mark mentioned this, in order to get this design basis we used the 2012 Central and Easter United States seismic source characterization. That supersedes, at least we've been working with the staff, the staff has requested the evaluation of the impact of this source model of course.

And the seismic design basis has been calculated with use of the source model and the use of 2004, 2006 EPRI Attenuation Equations, which is another important topic. So this represents the input to our calculations for seismic hazard.

So in the next slides what I'm going to do is I'm just going to give an overview of the Central and Eastern United States Source Characterization. I'm not going to get into too much detail, but I'm just going to tell what are its main features and what it consists of.

We used a seismic source model to estimate the seismic hazard at the site. And when we do this there's uncertainty. There's many things that are subject to interpretation, many opinions.

So we apply a tool that's called a Probabilistic Seismic Hazard Analysis that aids us in managing this uncertainty. And aids us in incorporating the knowledge of the scientific community and incorporate different interpretations.

One of the tools within the PSHA, Probabilistic Seismic Hazard Analysis, is a logic tree. So in this case this is the master logic tree of the Central and Eastern United States model. And one interpretation is to interpret seismicity with what is called maximum magnitude zones.

And another interpretation is the seismotectonic zones. The maximum magnitudes are just tied to general seismicity. The seismotectonic zones tie the sources to specific features. They receive different weights but they're both considered in the analysis.

Here's an example of what the maximum magnitude zones are. One of the examples, there's several interpretations of max zones. In this case there's two big zones, Mesozoic Extended Zone and the Mesozoic non-extended zone, showing here with the seismicity in the 200 mile radius.

So in the PSHA these source zones are divided into degrees in hazard from everything that's within the 200 mile radius and even beyond the source zone is incorporated into the analysis.

On Slide 14, this is a different interpretation with seismotectonic zones. These are tied to recognized seismotectonic features.

Slide 15. Another important aspect the CEUS Source model is the incorporation of repeated large magnitude earthquake zones. So these are the big faults. These are the features that can cause big earthquakes that do not behave the same way as general seismicity does.

They have their life. They have their own recurrence. Their own particular magnitudes. And they tend to present larger sized earthquakes of course.

And the best, or the most recognized feature in the Eastern United States is the New Madrid Fault Zone, which is highlighted here in this rectangle, and which is about 1,000 kilometers from the site. A little bit over 1,000 kilometers.

So here is the New Madrid source zone and here is the site. It's worth saying that we have responded to RAIs that have requested to analyze the impact of the New Madrid Source Zone to the site even though it's at significant distances away.

MEMBER SKILLMAN: Before you proceed, may I ask you to go back to 12, please?

MR. FERNANDEZ: Sure.

MEMBER SKILLMAN: What is the logic that accounts for this analysis, 60 percent for in max zones and 40 percent for seismotectonic zones? Why isn't it 50/50 or 80/20? What sets the 0.6 and 0.4?

MR. FERNANDEZ: Okay, I'll respond in two ways. The first one, I don't know. The second one, and that's part of the response. This tree is developed by what's called the Senior Seismic Hazard Analysis Committee process.

And this is a SSHAC Level 3 where that was performing, which the scientific community is joined, or is coordinated, by means of a technical integration to incorporate all those opinions and all those interpretations.

And through that process there's experts that are going to go and give more weight the maximum magnitude zones. Experts that are going to give more weight to the seismotectonic zones. And these weights will weight to the outcome of that process.

So my first part of the response, which it's true I'm not into the detail of what went on through that SSHAC Level 3 process. So the answer to that question relies on the SSHAC Committee that developed this seismic source model.

MEMBER SKILLMAN: Thank you.

CHAIR POWERS: But it would be a useful question to pose to the esteemed Professor Apostolakis some day.

MR. FERNANDEZ: Yes, it would be a useful question.

MEMBER SKILLMAN: If it was 50/50 or 80/20 might even change --

MR. FERNANDEZ: It will change.

MEMBER SKILLMAN: -- the ground motion.

CHAIR POWERS: It absolutely does. It is a very important split that they made. And Mr. Fernandez has appropriately characterized it. They got a bunch of experts, they came together. They came up with this number. And the documentation just doesn't help you very much to understand why this number and not 59/41 or something like that.

I mean, it is the number it is. And it will affect things.

MEMBER SKILLMAN: Thank you.

MR. FERNANDEZ: Sure. Okay, so that was the big picture of the Central and Eastern United States model. Of course this is a big report, going into the detail will take several days.

One of the things we have to recognize is that the Central Virginia seismic source zones and the Mineral, Virginia earthquake, it happened in August of 2011, so even though the source model was published a year after, still the seismic source characterization was already finished.

So it was a done deal by the time the earthquake came. And before the seismic source characterization was published so we responded to RAIs in sense of what was the impact of the Mineral earthquake to the old EPRI seismic source characterization.

At that time we didn't have the CEUS. So those RAIs were, in a way, superseded now by the new model and that RAI was transformed into what's the impact of what would the impact of the Mineral, Virginia earthquake be to the CEUS Seismic source characterization.

And that's being tracked as an open item by the staff right now through RAI 386. We have provided a response and it's currently under evaluation.

One of the things that is important to point out is that the magnitude of the earthquake is lower than all the values in the maximum magnitude distribution used in the model.

So the maximum magnitude of the earthquake is adequately covered by the model. We're also analyzing the recurrence rates and that's in the response to the RAI 386.

Other activities that are being tracked as open items, and these are through RAI 385, in terms of updates to the geologic and tectonic characterization of the site.

In other words did this earthquake change our understanding of the tectonic features? And this goes to what you were mentioning, Dr. Powers. Is there now a source that it's capable and we thought it wasn't capable?

Maybe this earthquake is giving that light. So that's something that's also information that --

And work that has been done as part of the response to RAI 385, we've resurfaced LiDAR images. We're showing an example here. After shock maps. Doing studies that relate, are looking for ties between earthquake and the tectonic features.

So some of the topics of interest that are being tracked as part of this open item. One of the Stafford Fault System, which is in the site region. How is the new seismic source model seismicity associated with this old systems. Are there any new indications of activity in the faults themselves.

More topics of interest, of course the Central Virginia Seismic Zone. And the evaluation of what's the causal relationship between known fault systems and the earthquake. That evaluation has been completed and the response has been provided to staff.

So after all this is said and done, many days, a few years of site investigations and characterization, field literature, analysis. We come to develop the ground motion response spectra. And this is the result of this process, the result of the Probabilistic Seismic Hazard Analysis.

And in Slide 20 what we're showing is a comparison of what the GMRS, Ground Motion Response Spectra, was when it was calculated with the EPRI 1986 seismic source model. And that's in red dashed line. And the new GMRS that is now calculated with the 2012 CEUS model. So the result is evident, we have an increase in the earthquake design basis.

The ground motion response spectra --

CHAIR POWERS: It's also worth pointing out, I think, that had you put the uncertainty down on these mean values that things fall, the overlap is substantial.

MR. FERNANDEZ: Correct.

MR. FINLEY: And in addition, and I think Antonio's going to the next slide. We had planned significant margin in terms of the design that -- Well I'll just let him do the talk here.

MR. FERNANDEZ: Yes, on the line of uncertainty the Regulatory Guidance, Reg Guide 1.208 and the use of uncertainty parameters in the ground motion attenuation equation, it's all being incorporated through the process. So the process actually does build conservatism over conservatism in a way, in order to adequately manage this uncertainty.

MEMBER STETKAR: Antonio, finish 21. I want to come back to uncertainties but I'll let you get to --

MR. FERNANDEZ: 21.

MEMBER STETKAR: Well 21 to 22 is the transition point so I'll let you finish 21.

MR. FERNANDEZ: Okay. On 21, remember a COL item that would say please compare your site-specific ground motion to the certified seismic design response spectra. So our site-specific motion is defined by our safe shutdown earthquake.

And this safe shutdown earthquake is, it's a broadband spectrum as you see here in blue solid line, anchored at Point 15-G. If I go back to Slide 20 this is above the 0.115 of the GMRS. So we're building some margin here.

At low frequency, this low frequency it's not that smooth spectra anymore because that was created by the new seismic source characterization that was created by incorporation of the New Madrid Seismic Zone defect of distant sources and the impact of the new source model, in general.

So we have here this comparison and there is an exceedance at low frequencies, below 0.7 Hz, it's this exceedance has to be reconciled in the structural analysis of the plant through a site-specific source structural analysis.

MEMBER STETKAR: Now I'll ask.

MR. FERNANDEZ: Okay.

MEMBER STETKAR: You didn't, in today's presentation, actually show the hazard curves with their uncertainties.

MR. FERNANDEZ: Correct.

MEMBER STETKAR: And I, when I was reading the report and reading the SER, I noticed some curious things. So I ran out a set of hazard curves from what I could find. And then fortunately yesterday I got Revision 9 of FSAR, that indeed has the hazard curves in there and I was happy to note that my hazard curves are the same as your hazard curves.

CHAIR POWERS: Are you bragging?

MEMBER STETKAR: I am. I was actually quite amazed.

CHAIR POWERS: So are the rest of us.

MEMBER STETKAR: I had to get that plug in anyway.

But one of the things I noticed and I'm really curious about is this notion of uncertainty. If I look at the hazard curves I note that the uncertainties are; A) Rather small and, B) Uniform across a wide range of accelerations.

For example, if I pull up in Rev 9 of the COLA, only because they show the different percentiles, at the 25 Hz response spectrum, hazard curves, over a range of about, pick a number, 0.1-G to about 5-G the ratio of the 95th percentile to the medium is uniformly three.

Now, that level of uncertainty, I've done a lot of data analysis, if we collect hundreds and hundreds of plant operating years of pieces of equipment like pumps and valves and diesel generators, we typically have uncertainties that range about a factor of two to three. With all of that data.

And here, for seismic hazard, out into accelerations that we ain't never seen, I have uniform uncertainty. So I'm really curious how this process captures that uncertainty.

MR. FERNANDEZ: I would have to take note of that --

MEMBER STETKAR: And this a generic issue, because if you're using all of the lock-step guidance from all of these wonderful references to develop these uncertainties, I think there's something wrong. I could be wrong.

But my experience is as you get less and less data and extend out to much, much higher ground accelerations in regions that you have absolutely no experience, one would expect one's uncertainty to increase.

And it does not. And that trend is uniform across all of the ground motion frequencies. So it's something that's systemic. And that bothers me a little bit when you start talking about the fact that the uncertainty might give us some help here.

If would perhaps if it were characterized appropriately but --

CHAIR POWERS: I don't think it's been characterized.

MEMBER STETKAR: I don't think it has.

CHAIR POWERS: I think it's been assumed.

MEMBER STETKAR: Well this certainly, I mean, it seems to be exactly a factor of three. At least I think I can derive from a long, long plot here.

CHAIR POWERS: I think that's the number they assumed in the SSHAC report.

MEMBER STETKAR: Well I haven't seen that in other characterizations. But those other characterizations are older. This is the first set of results that I've seen from the new processing of all of the NUREG Number 2150, I think that's the correct one.

MR. FERNANDEZ: There will be a relationship between that observation you have and the ground motion attenuation models.

MEMBER STETKAR: And I don't know whether that's --

MR. FERNANDEZ: And so that's where it's coming from.

MEMBER STETKAR: Is it?

MR. FERNANDEZ: Yes. Now, as to --

MEMBER STETKAR: I'm going to ask the staff about that when they come up.

MR. FERNANDEZ: Yes, why the ground motion models are what they are.

MEMBER STETKAR: Because it seems, if that's the case, I mean if the seismic source characterization is indeed, has much broader uncertainty, this seems that the ground motion attenuation is somehow reducing that uncertainty. Which seems counterintuitive.

MR. FERNANDEZ: The ground motion models are obviously limited in number but they're tied to the observations of the seismicity and the research and work from the --

MEMBER STETKAR: I just wanted to get that on the record, because it's contrary to what I've seen with seismic hazard analyses, as I said, the old days is you will. And this just happens to be the first application that I've seen from the new CEUS characterization out to a real site.

I've seen other stylized, sort of simplified evaluations. But this is the first one that I've seen and it's pretty striking.

MR. FINLEY: We'll take that action and if we can bring any more information today to the meeting, after the break perhaps, we'll try to do that.

MEMBER STETKAR: Okay. Thank you.

MR. FINLEY: You're certainly welcome.

MR. FERNANDEZ: Okay. So this is the outcome of our PSHA analysis. And the comparisons respond to the COLA items.

So moving on to Slide 22. There's two important inputs that are going to effect the seismic load that they structures actually receive. On obviously is the level of ground motion, which we already went through.

And the other key input into what is going to effect the structural response is the characteristics of the foundation media. So in other words the same earthquake will cause different structural response is the structure is founded in different soils.

So the U.S. EPR also request a comparison of our site-specific soil conditions to those soil conditions that were assumed in the analysis of the structural response of the buildings in the design certification.

One very important parameter is the shear wave velocity. So, in Slide 23, this is what we're comparing. We're comparing our site-specific shear wave velocity to the shear wave velocity profiles that are used in the design certification.

And at the beginning of this presentation I mentioned that there are a few things that are site-specific, as Section 2.5 and geotechnical conditions, geophysical conditions.

And here's one example. The generic soil files that are indicated with the dashed lines and provide a very good range of analysis cases for the U.S. EPR because --

CHAIR POWERS: Calling out the dashed line doesn't help with this figure. There's several of them.

MR. FERNANDEZ: Well all of the dashed lines that provide a range of analysis. And the U.S. EPR uses these range because they want to qualify this facility for a wide range of sites.

However, we get our site-specific shear wave velocity, which is the dark solid line, even though it's in this range considered by the U.S. EPR it has a unique characteristic. It's unique in itself. It has this impedance as shear wave velocity, or invergance in shear wave velocity that are not considered in the U.S. EPR design certification.

So the conclusion with this is that this calls for a site-specific full structure interaction analysis and a site-specific structural reconciliation process.

MEMBER SKILLMAN: Is the profile of your best estimate the product of your borings and the identification of the various --

MR. FERNANDEZ: Yes.

MEMBER SKILLMAN: -- sublayers through which the wave passes?

MR. FERNANDEZ: Yes. Right, the shear wave velocity I think you hit it right on the nail, that the shear wave velocity it's really a measure of how fast can seismic waves travel through the media. The faster the more bonded the media is.

And we measured it in site with geophysical measurement techniques, such as seismic probes that go into bore holes. And we introduce seismic waves into the bore hole and measure the arrival times in order to get the shear wave velocity.

And that is done not only with one bore hold location, and we're going to show later on the position of bore holes, it's done with a range of measurements throughout the site. And statistical analysis of those measurements to come up with a best estimate and those for lower bounds and over bounds that are used in the analysis.

MEMBER SKILLMAN: Thank you.

MEMBER SCHULTZ: Antonio, I think you're going to cover this next, but this is not a surprise that the evaluations done with all of the dotted lines would need to be examined different on a site-specific basis.

MR. FERNANDEZ: I don't think it's a surprise, no.

MEMBER SCHULTZ: Thank you.

MR. FERNANDEZ: Shifting a little gear right now to what falls within Section 2.5.3, which is surface faulting. Section 2.5.3 and surface faulting is tied to this COL item which requires the investigation of potential surface faulting in the site vicinity, in the 25 miles around the site.

We have performed this investigation, we have reviewed the latest EPRI/DOE 2012 Field document to see if there's any impact. Satellite imagery, ground investigations, interviews with experts in the fields and the conclusion, a strong conclusion that there's no evidence of surface faulting within the site vicinity in response to this COL item.

MEMBER SKILLMAN: Antonio, when you say that it kind of connected to my earlier question about the shelf 200 miles to the east. I'm curious you did a deep data probe that --

MR. FERNANDEZ: Yes, right. But that doesn't have the same reach rate.

MEMBER SKILLMAN: How far back do you go? Are you back to the Library of Congress? Are you in the local historical chapter down in your side regions going back to 1802 and 1816? The church steeple fell because there was a ground bump. I'm asking you, how far back do you go?

MR. FERNANDEZ: Let me ask our project geologist, Mike Rosenmeier, if he wants to comment on that line. And by the way I didn't introduce Mike Rosenmeier as project geologist, working for Rizzo Associates.

MR. ROSENMEIER: Mike Rosenmeier, I'm with Paul C. Rizzo Associates. To get to that question, there's on multiple levels. From the seismic event standpoint, earthquake standpoint, there are certainly historical records and that integrated into these databases.

There's obviously the more recent instrumental record which is certainly captured in the Central and Eastern United States Seismic Source Characterization. All of that is integrated into these databases with respect to some of the geologic investigations.

And particularly you've asked about this offshore realm. A lot of the offshore investigations really didn't start until the 60s, part of the deep sea drilling program and its more recent formats. So a lot of the offshore data collection is really limited to, say, mid-1960s to present.

So that geologic information offshore is more recent as far as integrating information on seismic events, it's not only instrumental records but does integrate known historical events as they're documented in newspaper clippings, reports and things like that.

MEMBER SKILLMAN: Okay, so let me pull this thread just a little bit further. It's a curiosity question but it bears on the application here. So if there is an anecdotal item from a newspaper in 1855, how would those who are in a seismology profession interpret a story?

MR. ROSENMEIER: I can't speak specifically to how say an anecdotal report would be evaluated in say the EPRI/DOE/NRC catalog. I mean obviously if it's anecdotal you can't put as much weight on something like that. And it's certainly much more difficult to properly estimate, there's going to be more uncertainty associated with, say earthquake magnitude estimates based on historical records.

You can look at shaking damage, things like that, and come up with estimates. But obviously if you're talking about an event that happened in the mid-1800s, there's going to be much greater uncertainty tied to trying to establish those sorts of relationships as opposed to, you know, instrumental record. So there is --

CHAIR POWERS: It also depends on what you do to follow up, that if you have a geological record of a substantial amount of sand blows associated with that anecdote then it's just what you say, your uncertainty starts collapsing down.

Unfortunately at this stage, whether you have sand blows or not depends a little bit on; A) in somebody's book, and B) have they been destroyed by other kinds of phenomena. I mean 1850s is nothing. It's 900 A.D. kinds of things that are much more appropriate, are also considered in this record.

And it's pretty much what he said, your

uncertainty is vague and as you get more information it's a little bit smaller. But it's all non-trivial uncertainty.

MR. FERNANDEZ: Thank you.

MEMBER SKILLMAN: Thank you.

MR. FERNANDEZ: So I'm going to describe also a high level picture of the geotechnical investigation. Now we're going from the site region to vicinity. Through the PSHA and narrowing down on the site itself, going to what the site-specific tests are.

The site investigation started in 2006 with a comprehensive set of bore hole explorations, continued through Phase 2 in 2008 with additional bore logs. Additional cone penetrometer tests, pressure meter tests, geophysical tests to shear wave velocities.

In 2009 there was a program to test potential vacuum sources for the site. We took samples from offsite quarries to analyze the quality and quantity of backfill that can be used for the site. Performed sophisticated laboratory tests to qualify that backfill.

So I'm in Slide 27, so I'm not intending here for you to be able to read this slide, of course, because it's too crowded. But the purpose to show --

CHAIR POWERS: I was going to request that we get the raw data and the original level diagrams and replot.

MEMBER SKILLMAN: Thank you.

MR. FERNANDEZ: So the dots of course are boring lots, or wells for points of the investigation. And we have here what's the main Unit 3 cluster, the powerblock area, there were bore holes formed, it was a Unit 4 lay down area, cooling towers, intake --

CHAIR POWERS: Now I understand why you're having so much difficulty with your hydrology, because you got all these holes.

(Laughter.)

MR. FERNANDEZ: Okay, so the message here is we know this site. We've come to understand it, not only at the bore hole level but with this extent and reach of the investigation over the distance of the site. We feel very comfortable that we have, for lack of better, we have figured it out. We know what the geotechnical conditions are at the site.

CHAIR POWERS: Yes, and it looks like it's pretty simple. It's not the best dirt I've ever seen but it's pretty simple layers of dirt.

MR. FERNANDEZ: Yes, don't tell that to a geologist.

CHAIR POWERS: Oh, guy, don't talk to them because they can write 500 pages on each one of these layers. And do, that's the problem.

MR. FERNANDEZ: So a little bit about how buildings are, this is a diagram of the U.S. EPR main buildings, Nuclear Island, NI. ESWB, essential service water buildings. EPGBs are emergency power generator building. Turbine building and switch gear building. Also some support facilities, Access Building and the Nuclear Auxiliary Building.

So this is the general layout. If we look at it in terms of a soil profile we have, yes, a uniform soil profile. And uniform conditions. And we'll speak to that a little bit later because that's another COL item.

Site grade is placed at elevation 85. The backfield is placed down to elevation 41-1/2. And that backfield is used to replace the surface terra sands, which are inadequate for engineering foundation purposes.

Next slide is same type of representation for the common basemat intake structure. Also the backfill is placed around the structure and the structure rests on the native Chesapeake clay.

I'm going to show in the next slides the shear wave velocities for the intake area and the powerblock area.

If you noticed the variation on the first two layers, and I can explain. I'd like to explain a little bit more on what causes those two.

First the backfill, that's manmade material, that's not Mother Nature compressed. It's mechanically compacted material. So as we gain more compaction through over-burden, so there's more soil on top of the one that was placed below, we expect a higher shear wave velocity. And this has been verified through laboratory tests.

Okay, so that's why we have them go 790, 900, 1,080. At the point of foundation we are above a thousand, on the Nuclear Island, we're above a 1,000 feet per second.

Then the native Chesapeake cemented sand has different levels of shear wave velocity because there's different levels of both cementation and different levels of clay content. Where there's additional clay content the shear wave velocity tends to be lower than when there's less.

Pretty uniform from down there on. And we performed measurements down to a depth of 350 to 400 feet. So these profiles come from site-specific measurements.

Mark mentioned that we had two departures in the beginning of the presentation. One is related to shear wave velocity. The emergency power generation building, it's founded on the engineered backfill. I'm going to go back to Slide 29.

And at that level the backfill doesn't have the U.S. EPR specified shear wave velocity of 1,000 feet per second. So that constitutes a departure and that's being reconciled in FSAR Section 3.7. Again, with a site specific soil structure interaction analysis.

So down lower shear wave velocity is accounted for in the analysis.

CHAIR POWERS: When you assess nature of backfill has a shear wave velocity profile runs from about 800 feet per second down to about 1,100 feet per second, something like that, that's done before you put the installation in?

MR. FERNANDEZ: Correct.

CHAIR POWERS: After you put the installation you clearly get some compaction.

MR. FERNANDEZ: Correct.

CHAIR POWERS: But you're not counting that compaction yet?

MR. FERNANDEZ: Okay, yes let me elaborate into that. Yes, that variation that you observed from say 790 or 800 over 1,000 feet per second, that's a profile that's established by testing of these backfill samples. And we performed these tests at different confining pressures.

So we do take into account the confining. Now that's what happens in the laboratory, what happens in the field of course, then all the machinery comes and all those processes, that's tracked through an ITAC that we have in place for the shear wave velocity.

CHAIR POWERS: Okay, thank you.

MR. FERNANDEZ: Okay, U.S. EPR also requests that backfill properties are very well characterized and that has been performed, like I said, with site-specific bulk samples and what we call Resonant Column Torsional Shear Tests, which they're specialized tests to calculate the elastic and properties of the soil.

And also how the soils can respond to seismic ground motion. And that's how what we use to establish that shear wave velocity profiles that you just saw.

Next COL Item, we're going to go through some of the COL items that are critical here in terms of structural reconciliation. And one of them is bearing capacity. According to U.S. EPR we have to verify that our foundation soils have adequate bearing capacity with a factor of safety of three under static conditions. And a factor of safety of two under dynamic conditions.

That means our bearing capacity has to be, our allowable bearing capacity, has to be higher than the bearing pressures asserted by the U.S. EPR and that allowable bearing capacity has to be a factor of safety over magnitude less than the ultimate burden capacity.

So what we do is calculate our burden capacity at the site and we divide it by three and that's what we use an allowable, in order to fulfill this COL Item.

Calculate the disparate capacities using several methods and several approaches. And we've done a wide range of them. And that this, their capacities are what they are from the soil and they are going to be confirmed with the very pressures exerted from the structures in Section 3.7.

Settlement, that's another very, very important, about the most important item here at a soil site like Calvert Cliffs.

The U.S. EPR specifies that a comprehensive site settlement evaluation needs to be performed, including short-term and long-term settlement effects.

Analyze the effect of, heed when the excavation is performed, how is settlement going to behave as structural loads start coming into the site. The U.S. EPR also provides some limits as to what is the amount of differential settlement that can be tolerated. And there's a specification of ½ an inch per fifty feet, which it's a measure of tilt.

So going here to the next slide, Slide 36, and settlement we can estimate with a very simple hand calculation all the way to a very sophisticated analysis. We can do it all. And when we're estimating settlement values we do the simple to the sophisticated.

In our investigation we've done them, we can never use the word all, but we've done a wide range of methods and approaches to estimate settlement. We have worked with the staff through this process for years in order to get our best estimate for settlement.

And so we have incorporated sophisticated models, that are three-dimensional, that are capable of modeling the slight variations of the soil layers. That are capable of capturing time-dependent settlement that can account for the effect of neighboring structures.

For example, the Nuclear Island will tend to drive the settlement a little bit of the neighboring fieldings. Kind of like if we were on a mattress, it will affect the whole area. The same thing happens at the Calvert site.

So the settlement model that has been developed incorporates all of these sophistications. It's done through a finite element method, lots of analysis and efforts that you probably won't see in other applications. But, of course, this is a peculiar site for this and it's well deserved.

We have included a settlement monitoring program as part of the application, that is also included in Section 2.5.

The outcome of this analysis is summarized with -- Yes?

MEMBER STETKAR: When I read 2.5, you're monitoring essentially all of the buildings for settlement is that correct?

MR. FERNANDEZ: Yes, correct.

MEMBER STETKAR: Because I didn't notice the EPGBs listed there, but I'm assuming that was just an oversight.

MR. FERNANDEZ: We are --

MEMBER STETKAR: You listed everything. I mean even Rad Waste building you listed.

MR. FERNANDEZ: But yes the settlement --

MEMBER STETKAR: The only reason I bring that up is one of them is one of the three that you identified, but you may want to take a, I didn't see it but it should be monitored.

MR. FERNANDEZ: It should be. So this is, to summarize this of the result, there's many data in the results in the settlement analysis. But I'm going to point to the darker line here, which is our best estimate for settlement. And it shows the settlement at the site, in this case at the center point of containment as a function of time under construction.

And one of the important things to notice here is that once the loads are finalized, once construction ended there in Step 8, around 2,000 days, basically the settlement process is finalized.

At that point in time we have experienced, the soil has responded in terms of settlement. And the long-term settlement remains negligible, which is unimportant now.

So as you were pointing out, one of the departure relates to the emergency and essential buildings tilt, which there is a level of exceedance over the ½ and inch over 50 feet. And this exceedance is being reconciled also as part of Section 3.7 and 3.8, accordingly.

Next COL Item. This relates to how seismic substructure interaction is --

MEMBER SKILLMAN: Just a quick comment here.

MR. FERNANDEZ: Sure.

MEMBER SKILLMAN: What is the real risk to the plant if your settlement predictions are not fulfilled? It seems to me that between buildings, where there's a settlement that you did not anticipate, the risk would be structures, pipes, connections, conduits, cabling that is tensioned or twisted or bent beyond what you anticipate in your basic engineering design.

So my question is, for the uncertainty in settlement between buildings and this departure, is there an engineering remedy that you have applied?

MR. FERNANDEZ: That's a very good question. And right now it's also being tracked through an ITAAC that we have from the staff. WE have an RAI to incorporate an ITAAC on settlement that deals with that question. What is the description of your settlement monitoring program and what actions are you taking to deal with those types of risks in case your settlement estimate exceeds your expectations?

Now on that line, of course if you go back here to this plot, and that ITAAC is being responded to as part our current RAI response, which is one of the open items that we have.

But going back here to the plot that you're seeing and the issue here that we're mentioning, that settlement, pretty much ends its process after loads are being introduced.

So that risk is minimized with engineering measures such as wait for the proper time to incorporate connections and pipes, cables, between buildings. Make sure that buildings are in place.

Settlement reaches that asymptotic behavior, right, we want to see settlement reaching that asymptotic behavior that you see in this plant. And when we have that observation then that's the prudent time to incorporate and implement those connections.

Also, some of the design of those items have to account for the fact that there's differential settlement expected at the site.

MEMBER SKILLMAN: Would those measures include the, particularly, underground piping and underground conduit? Because it would seem to me that that is where the real fiscal risk and perhaps future operability risks lie.

MR. FERNANDEZ: Yes, that's going to be

tracked in this open item right now that we have through part of that ITAAC. We have that question in place from the start.

MEMBER SKILLMAN: Okay. Just one more. What is the experience at Units 1 and 2 on settling?

MR. FERNANDEZ: We've did our research on Units 1 and 2 in their documentation. We have had no evidence of settlement monitoring data.

MEMBER SKILLMAN: There's no data or no monitoring?

MR. FERNANDEZ: No monitoring.

MEMBER SKILLMAN: So you didn't monitor Unit 1 and 2.

MR. FINLEY: To our knowledge, and Bechtel can chime in, of course Bechtel was the constructor for Unit 1 and 2 and they're part of our team here. We looked and could not find any data, any results output from a monitoring program. Or any indication of problems related to settlement.

Now, the grade is slightly different, they're about 45 foot-grade as opposed to the 85 foot-grade, I'm not sure that makes a significant difference or not. But we have not been able to uncover problems at Unit 1 and Unit 2 with settlement.

MEMBER SKILLMAN: Well apparently, you

know, the sites are not the same but they're in the same five mile radius so one would think perhaps there's settlement.

MR. FERNANDEZ: We have confirmed the outcome of their geotechnical investigation. And there is a correspondence between the geotechnical units that we've shown here, Chesapeake sand, Chesapeake clays in this location and the location of Units 1 and2. So that same soil profile extends. And like Mark said at the same token that there's no monitoring, to our knowledge, the results are no evidence of --

MEMBER SKILLMAN: Of settlement.

MR. FERNANDEZ: -- of settlement that has caused disruptions or problems.

MEMBER SKILLMAN: Okay, so for Calvert Cliffs 3, it's really the RAI and the monitoring to give you the assurance that you're not going to have differential settlement that would be problematic?

MR. FERNANDEZ: It's a monitoring effort.

MR. FINLEY: Yes, and I would also add that it's part of the design of the construction schedule, if you will, to make those connections toward the end of the process after you get some feedback from your monitoring program to tell you whether your design for those connections is appropriate or not.

MEMBER SKILLMAN: Okay, thank you.

MR. FINLEY: Sure.

MR. FERNANDEZ: I was, I think, at Slide 40 going to the uniformity of soil layers, a COL Item. And this COL Item is related to actually the fact that substructure interaction analysis is mostly performed with models that make the assumptions that soil layers are uniform.

Meaning if a foundation is half sitting on rock and half sitting on soil that would require us to kind of specialize substructure or actual analysis that it's not accounted for in the design certification.

So design certification asks the applicant to confirm that the foundation is resting on a uniform medium. And this is the COL Item we use to track it. So we take into account three aspects; presence of soil and rock, dip angle of soil layers and shear wave velocity.

So in terms of presence of soil and rock the foundation is all resting on soil. Or it's on all layers. The dip of these soil layers is not significant, it's a mild dip so we can assume that therefore is soil for engineering analysis purposes.

And the shear wave velocity, I'm going to show you a plot on the next slide of measurements of shear wave velocity that are made through the powerblock area.

In the upper left corner you see a little sketch of the powerblock area and the distance between the measurements, on this line it's greater than 1,500 feet probably. They're quite spread apart.

And once we offset these shear wave velocity measurements at the same elevation we're comparing here the shear wave velocity at the center of containment to the other shear wave velocity measurements and we observe that we have evidence that the shear wave velocity is uniform across the site and this gives us reassurance that we have a uniform site all across.

Not only in the basemat of the foundation of the Nuclear Island, but actually across the whole site. So with this evidence we can go ahead and provide this soil profile, that I'm showing Slide 43 for, substructure interaction analysis purposes.

Now this is not the shear wave velocity profile, it's just a geotechnical unit profile. Shear wave velocities are as I showed before.

We're going through Section 2.5.1, Geology, 2.5.2 Vibratory ground motion. 5.3 Surface faulting. 5.4 Geotechnical and foundations. Now last part of 2.5 is 2.5.5, which is Stability of Slopes, Embankments, Dams that need to be verified according to the U.S. EPR.

We have evaluated the stability of the slopes on the site, both man-made slopes that are an outcome of the flood plan. And the natural slopes that are at the site.

CHAIR POWERS: This is a question that had never crossed my mind. Who is Calvert?

MR. FINLEY: Lord Calvert. I'm not sure, you know, I'm not sure I know enough to really expand on this, but -- I'm sorry Bechtel wants to answer this, I think.

MR. RAO: I was just saying, this is an native history question.

MR. FINLEY: Yes. There was a Lord Calvert, I'm not sure exactly what he did, Doctor, but yes he's real.

CHAIR POWERS: He built these cliffs apparently.

MR. FERNANDEZ: Okay. So there's a couple of constructed slopes, more than a couple here, that in Slide 45 I'm showing examples here. That's a representation of the flood plan after site grading for construction.

There's two important slopes that are man-made. One I'm showing you as Section A in the powerblock area. And the other one at Section G in the intake area. Let me show them in profile.

They're safety designed, this is something we can control. Like I said the terrace sands in the powerblock area are removed for stability purposes and replaced by structural backfill. And the slopes of the slopes are designed in a way which factors of safety against sliding, both dynamic and static. And actually meet additional margin.

Same with the intake area, in order to accommodate the intake area is designed, this is a man-made slope as well, to get the adequate safety.

And these factors of safety of course are reported in the FSAR. Natural slopes, see you have the Calvert Cliffs in the area, we go back here to the plan. You can see the cliffs here in this, near the shore.

We, in the intake area, those cliffs are basically removed and replaced by a new construction. In the powerblock area those slopes are a significant distance from the facility so any potential toppling of the cliff does not impact the site.

So that's the conclusion in terms of stability of slopes, we have established that both man-made and natural slopes at the site are safe. There's not many of them.

I think that reaches the end of our presentation. Mark, you want to --

MEMBER STETKAR: So, Antonio --

MR. FINLEY: Thank you, yes. Before we close let me ask, are there other questions for Antonio. We took the one action I'm aware of with regard to the uncertainty of the hazard curves and we'll try to get back to you on that.

Any other questions?

Okay good, hearing none then. To conclude -- I didn't give enough time, Dr. Stetkar?

MEMBER STETKAR: No, no, no. I was going to say you're learning. Fifteen seconds of silence means carry on.

MR. FINLEY: Okay. In conclusion we talked about the two departures and related exemptions. And the fact that we have no contentions at this time. We have 11 COL information items that we've responded to. There are eight open items currently with the staff and they'll talk to those. And one of those relates to a new RAI that we have, RAI 390, recently.

MR. FERNANDEZ: And that's the one on settlement monitoring.

MR. FINLEY: Okay, settlement monitoring. So Antonio discussed that.

And with that that closes our presentation. Thank you very much.

CHAIR POWERS: Any other questions to pose here? We're a little bit ahead of schedule, but I don't really like the schedule that we have so I'm going to go ahead and take a 15 minute break. And then we'll come back and listen to the staff's response. So quarter after.

(Whereupon, the meeting in the above-entitled matter went off the record at 10:00 a.m., and went back on the record at 10:16 a.m.)

CHAIR POWERS: We're back in session. We're now going to listen to the staff's comments concerning Chapter 2 and in particular Section 2.5.

MS. FORD: Right. Thank you. Good morning, my Tanya Ford and I am a project manager and currently responsible for the staff reviews of Chapters 2, 17, 18 and 19 for the U.S. EPR Design Center, which includes Calvert Cliffs Number 3 and Bell Bend COL Applications.

This morning we will be presenting Chapter 2, Section 2.5 for the Calvert Cliffs COL application. Let's skip through some of the previous slides that we've already discussed.

Before the technical staff gets started I'd like to give a quick overview of FSAR Section 2.5 of COLA. There were a total of 133 RAI questions sent to the applicant of which eight were identified as open items.

The staff has recently received responses addressing some of the open items which are currently under review by the staff at this time.

The staff review team and presenters for today's Section 2.5 presentation are Dr. Alice Stieve, a geologist and responsible for Sections 2.5.1 and 2.5.3.

Dr. Dogan Seber, a senior geophysicist responsible for Section 2.5.2. And Dr. Weijun Wang senior geotechnical engineer responsible for Sections 2.5.4 and 2.5.5.

And I'd also like to highlight that we do have support from their branch chiefs today for the geoscience and technical engineering branches we have Rebecca Karas who is responsible for Branch 1. And Diane Jackson, responsible for Branch 2.

At this time I will turn the presentation over to the technical staff, starting with Dr. Stieve, who will discuss the staff's review of Sections 2.5.1 and 2.5.3. Dr. Stieve.

DR. STIEVE: Thank you. My name is Alice

Stieve, I'm a geologist at NRC and in particular NRO for five years. My previous experience is at Savannah River site in South Carolina. And I worked for Bechtel there for 19 years. I have a masters and a PhD in geology with an emphasis on structural geology.

And, at SRS, I was tech lead on the evaluation of Pen Branch fault to determine a capable fault aspect of that for K reactor recert. And after that I did a groundwater contamination, characterization and remediation.

My sections are 2.5.1 and 2.5.3, I'm going to present them together. And the 2.5.1 is basic geologic information. I reviewed for the regional and site geology which includes stratigraphy, the geologic history, tectonic setting and principle tectonic structures.

And in 2.5.3, which is surface faulting, that evaluates for the geologic evidence that addresses the potential for surface deformation due to faulting, tectonic and non-tectonic. And of course that would include ground subsidence due to limestone dissolution collapse.

Next slide, thank you.

For Section 2.5.1 there are some open items that prevent me from making my final conclusion on the three topics of the Stafford fault, National faults and the Central Virginia Seismic Zone.

I did get, recently I got the response from the applicants and I have looked through them and they look. And so I am going to be able to resolve those open items with the next update of SE.

And, in general, I find that the geology of the site region and the site vicinity is not going to adversely affect the design and operation of the unit.

And the geology of the site region are in support of the evaluations that are done in the seismology section, 2.5.2, and support the surface deformation evaluation in Section 2.5.3.

For Section 2.5.3 I find that the potential for surface tectonic and non-tectonic deformation is negligible or non-existent per 100.23(d)(2) within the site vicinity.

Next slide. So what I found in my review of the FSAR it turned out to be the primary topic of interest was some geologically young faults in the site vicinity.

Since I find that there was no massive limestone in the stratigraphic section, there was no concern about a dissolution hazard for the assessment of potential for surface deformation.

As part of my review I wrote a series of RAIs, as you can see in that original table, to prompt the applicant to provide me with a more thorough evaluation of tectonic features and to provide a more thorough basis for their conclusions.

And we made a field trip to the site during our site audit. And a particular type of that visit was to go to Moran Landing to evaluate the interpretation of Susan Kidwell in her inferred fault. I'll talk to you more about that shortly.

In addition, I talked to several authors, either via email or directly over the phone, of published papers that pertain to the Calvert Cliffs site. Including Dave Prow from USGS, retired. Scott Southworth from USGS, he does a lot of very sophisticated tectonic mapping in the region.

I talked with Dave Powers who also does field work in the Delmarva Peninsula and over toward the Spotsylvania Fault. He's also USGS.

I consulted with Russ Wheeler, USGS. He's the author of the Quaternary Database, he and Tony Crone are the ones who did that. Now, that is 2006 so that's starting to get a little dated.

So I had to be careful in reviewing all of the literature that's been published since that time.

And I had to rely on the applicant to verify for me that he has done an adequate reconnaissance of the area and site vicinity to make sure that nothing has fallen through the cracks.

And I did include Russ Wheeler on our site visit. I also consulted with Randy Cox, also of USGS. He is a quaternary geologist and a geomorphologist and also a paleoseismology kind of person. So he was very good to help us evaluate the unconsolidated segments that are at the surface of Calvert Cliffs.

And then also in addition, I'll talk more about it later, is I considered carefully the materials that were submitted by June Sevilla as part of the contention, that was not admitted. But included in that contention was there were statements by geologists, Dr. Peter Volt and Dr. Susan Kidwell.

And, of course I was particularly interested in what Kidwell had to say because her paper pertains to that fault that was nearby. Next slide, thanks.

This is a picture of the site region, the 200 mile region. This is to demonstrate, to show how the site is in a seismic tectonic zone off extended continental crust. They look like, I guess, a pinkish beige feature on the screen.

These are the Mesozoic basins and they are an indication of extensional tectonics. And that extensional tectonic era ended at this Mesozoic boundary about 65 million years ago.

The basins off to the west are exposed at the surface. And then past this line here, where the dark gray goes into light gray, this is where the coastal plain on land is covering. And these are subsurface rift basins. And then Calvert Cliffs is right here.

And then further off there are some more basins that are offshore. The dark lines are a variety of faults that range in age Paleozoic to more recent time. And the map is providing a general pictures of the northeast trending fabric of the Appalachian origin. Next.

So here are the four faults that I looked at. I'll show you a figure, in a slide or two, where they are. But there's this inferred fault at Moran Landing, about a mile south of the site. This is the one that Susan Kidwell interpreted in her stratigraphic measured sections in her paper.

Then there's the Hillville Fault, which touches the five mile radius, Hanson in '86 published that interpretation. That's seen on seismic reflection. I'll show you a little bit of that.

The McCarten et al, interpreted 3 Monoclines within two 10 miles of the site. The Monoclines imply that maybe there's faulting at further depth.

Then the other one is the inferred fault in the North Chesapeake Bay, which is well beyond the 25 mile site vicinity, that Frank Pazzaglia has interpreted.

Next. Okay.

And so I've already stated that I considered the stuff that was submitted by Peter Volt and Susan Kidwell as part of that submission to make sure I understood what their perspective was.

And then I also was considering new, I was also looking at the new geologic information that's emerging from the Central Virginia Seismic Zone, which is within 100 miles of Calvert Cliffs.

After that Mineral, Virginia earthquake of course there was a lot of attention and a lot of seismologists went down there to look at the aftershocks. And then after that the geologists came on down to visit the site to see if there was evidence of surface deformation or reactivated faults.

There's a bunch of faults that go through that general area. Most of them are going to be

Paleozoic, but you know Paleozoic faults can reactivate. And the Mesozoic faults can reactivate and the Cenozoic.

And so the geologists wanted to evaluate because those earthquakes are so shallow they can more directly relate to surface geology than say something that's going on, like down in Charleston where the earthquakes are very deep and they're very well buried underneath a different kind of geology at the top.

So a lot of USGS and universities, the geologic survey of Virginia, were down there looking at reinvestigating these faults and geomorphic features. And there's abstracts. There are no papers right now that are coming out with conclusions. But I wanted to make sure that this was captured in my consideration for the Calvert Cliffs.

So to talk more about the faults. I want to emphasize that there are no fault plains observed for any of those faults that I -- if you would go back a slide. Thank you.

For any of these faults, there are no fault plains that we see at the surface or in the cliffs or fault scars across the landscape.

And for Moran Landing it stratigraphic evidence that led her to believe there was a fault, which is maybe not quite as direct as you would like to know, like for instance, with a seismic reflection. There's no bore hold data to support that or anything.

The Hillville Fault has seismic reflection data and some bore hole data. The Interpreted Monoclines is based on regional stratigraphic understanding and some bore hill data. No seismic reflection.

And there is other regional information, structure contour maps that were done by independent researchers who found that different important stratigraphic intervals were flatlined. So that, in a sense, counters some of these other interpretations of faults.

Okay, next slide.

So in Kidwell's input to June Sevilla's contention she stated that the applicant's conclusions were conservative but scientifically fine. Quote/unquote. Those were her quotes. And she calls it a postulated fault herself. And she says that no fault plain is exposed and it must be inferred.

Next slide please. Thank you.

Okay, so this is a picture of tertiary tectonic features. You saw that earlier from the applicant. And here we have Calvert Cliffs. And this radius is the 25 mile radius, the site vicinity. And here is the Hillville fault, with relation to Calvert Cliffs site.

And these three triangles are where McCarten placed in Monoclines. Up here, way up here to the north is where Frank Pazzaglia inferred a fault in the North Chesapeake Bay. And these are some other youngish faults over here that I wrote RAIs about. And I'm not going to talk about those today necessarily.

Okay, next slide.

So a closer view. I'm sorry that this is so fuzzy. It did not want to copy out of the FSAR. It's LiDAR, the base map is LiDAR and it's supposed to show a very fine detail of topography. But you're going to be hard pressed to actually see that here.

This is the five mile radius around the site. This is the site area. And on here are features along Calvert Cliffs. And you can Moran Landing, and it's within the one mile proximity to the site. And over here there's the Hillville fault that's at about five miles.

The Hillville Fault is known from the seismic reflection line that occurs right here. That's there that seismic reflection line is. And as they extended it off here to the northeast, when you examine the cliff exposures here there's no evidence of any kind of deformation in that vicinity.

McCarten's Monoclines are on this map, they're down here. And there's one about over here. And I think there's one right about here.

Next slide.

This is a typical view of the cliff. This is Moran Landing. It is viewing to the north. This part of the section here, the choptank and the St. Mary's Formation, those are marine formations. There's a big erosional unconformity here. And up on top of that we have Upland deposits that are into Pliocene.

There is really no Quaternary shown in this picture. There might possibly be some quaternary that back up these stream channels that break the cliff, erode the cliff away. And the beach deposits are Holocene of course.

So Kidwell was measuring the sections all along the Calvert Cliffs. And here, between the north side of Moran Landing and the south side, which I don't have a picture of, she interpreted a difference of a couple of meters, and a couple of meters are her words, between some of the stratigraphic intervals.

She did not see a fault. She did not see a fold, she just saw a difference in elevation. And the inference is that the fault is over here where this gap is. So we can't see, we can't evaluate it more than that.

Let's go to the next slide.

And this is a stratigraphic section. In this part here Miocene and Pliocene in the Chesapeake group in the upland deposits. This is what is typically exposed in the Calvert Cliffs near the site.

And down here in the lower part of the tertiary, this is the possible upward penetration of the Hillville Fault, as interpreted by Hanson. And down here is the coastal plain, crystalline basement rock contact, which is at about 2,600 feet in depth.

Okay, next slide.

Once of Kidwell's concerns about her fault was that she felt that there were allying streams in the area and that the topographic maps showed a large amount of straight stream sites. And when we were at Calvert Cliffs at Moran Landing it was pretty obvious that there was a very strong joint set that was perpendicular to the cliff face.

And when you examine the joint surfaces you see a twist tackle on them, which is a clear indication that they were expansion and so they're like release things. They're not like a tectonic feature. And because they're perpendicular to the cliff they are oriented to these stream alignments.

So I felt that in conjunction with consulting with the geomorphologist, Randy Cox, that these are very likely the cause of the stream segments, not necessarily a tectonic deformation signal. And you also can see some undulations in the bedding here too. So you know these sediments are never laid down perfectly flat.

Next slide.

So this is a view of some the definitive data about the Hillville Fault. This is old seismic reflection data, it was taken to image deep in the section so it's not going to disclose stuff that is shallow in the section.

So this part of the profile has no data whatsoever. The basement is the contact between the sediments of the coastal plain sitting on top of crystalline rock. And that makes for a very good reflector and so this structure that's right here, it's a set of a couple of faults, that offset the basement about 250 feet.

So there's really a fault down there, it's a tectonic, it's through-going. Can't see anything below it because the acquisition parameters were probably not, or they were not processed to image below this very ringing reflector right here.

Hanson, based on a few stratigraphic bore holes, brought his interpretation of this fault up into the lower part of tertiary. You can't really see that on the seismic reflection line. It goes off into the mist.

Next slide.

This is the cross-section that McCarten, et al, provided for two of their monoclines. And you can see there's very little bore hole data, its' very widely spaced. Now they did use regional stratigraphic relationships and that.

But as you get closer to the surface, as you get into the Miocene section you can see that it's, the monocline isn't up there, and you could interpret, even here, you could interpret just as a smoothly dipping, typical coastal plain layer going to the southeast.

Next slide.

And this is NRC folks and the Applicant and the Applicant's consultants at the base of the Calvert Cliffs talking about the evidence that we were looking at there for Kidwell's Fault. And this was during the site safety audit. I think it was in January or February and it was so bitter cold it was painful to be out there.

And this is, just a little picture of fossils and sandy Choptank formation. And that is the end of my presentation. And I'd like to answer any of your questions.

MEMBER STETKAR: You said the northeast extension of the Hillville Fault, there are question marks about it. What sort of evidence is there, other than you said there is no -- There you go. No indications at least on the exposed cliffs of any deformation where that fault is postulated to exist. Do you have any other conclusive evidence about its existence under the peninsula?

DR. STIEVE: The only definitive piece of evidence that we've got a fault there is that seismic reflection line. Then the connection with the Sussex-Currioman Magnetic Anomaly. And that is, you know, that's not a real direct thing. There is no evidence in the cliff. That's all I can tell you.

But you wouldn't expect it --

MEMBER STETKAR: No, I was going to say you wouldn't expect there's no evidence there. That's not conclusive.

DR. STIEVE: Yes, well it's too deep in the first place. Hanson didn't interpret it shallow in the section. He only brought it up into the lower part of the tertiary. And as I showed you in that stratigraphic, that simple stratigraphic chart, you're not going to see that in the cliffs, if we skip over to that.

You understand that, right? See, because this is what the cliff exposes and where, yes we're not going to see it.

MEMBER STETKAR: Yes.

DR. STIEVE: So there was also --

MEMBER STETKAR: The only reason I asked that is it's stated, I think in the SER, that there's no evidence in the cliffs. But that's --

DR. STIEVE: But that's what it is. I mean we looked at it --

MEMBER STETKAR: That's true. If there were evidence of some sort of --

DR. STIEVE: Well, or no, you get maybe a fold or a monocline. And the fact that there is no evidence there means that it must be older than Miocene, which makes me feel better, all right? It makes it older.

MEMBER STETKAR: Oh, okay.

DR. STIEVE: Because you could have a fault going right underneath the site and if it's Paleozoic what difference does it make? If it's truly Paleozoic. And that cliff exposure tells me that there's no obvious evidence for something coming that shallow in the section. So it's old. It's older than we need to worry about.

And offshore, further to the northeast, into the Chesapeake Bay there was marine seismic that was done, for another purpose. But they did not find anything in the base of the Chesapeake Bay to show that there's any kind of a surface expression in the base of the Chesapeake Bay.

MEMBER STETKAR: Thank you.

DR. STIEVE: Any other questions.

CHAIR POWERS: Charge ahead.

MEMBER SKILLMAN: Seconds of silence is acquiescence here.

DR. SEBER: Then I'll pick it up here. I'll be discussing the Section 2.5.2, which is primarily seismic hazard and in terms of PSHA calculations as well as the site response calculations to apply some site specific corrections to the seismic hazard that we calculate at the, what we call the hard rock ground motions. And briefly discuss the GMRS which basically ends the 2.5.2 Section of the Vibratory Ground Motion.

As has been already discussed earlier by the Applicant, key thing to identify here is that initially when we started the review we were dealing with the EPRI-SOG seismic source models. And that will be continued almost like four years on and off.

And very recently, September, we got a new seismic source model results. Seismic source model being the Central Eastern US Seismic Source Model, published now in NUREG-2115.

And with that, of course, because the model changed, pretty much the entire structure of 2.5.2 changed and we have to reevaluate the complete analysis. We have to a complete analysis and reevaluate the findings that we had at that point.

And a couple of bullets here highlighting some of these things. Another important issue here is that, which is usually not done but in this case it's the exception I guess, is 2.5.2 review was primarily based on FSAR markups to Revision 8.

So it wasn't Revision 8, it is not Revision 9. Since then of course we received Revision 9, but during time of the review we were primarily focusing on it.

That's why if you read the FSAR you see that the figure from this markup, this page and things like that, that's just in order to highlight that. Of course we revised when the final SER is written and provide it.

2.5.2 usually has two COL Information Items and also has been discussed, I'm not going to spend too much time. One is ultimately reaching the SSE. The way we get to that point is establishing the ground motion response spectrum, the so-called GMRS. And from that we can estimate the SEE.

And the second part is whether or not the SSE or GMRS is complying with the seismic design response spectra, so-called SCDRS.

And those are the primary things. And what we have done in the review, we basically confirm applicant's analyses on the COL information items. As well as determining that adequate process has been established.

So next slide, please.

Again, this has been mentioned so I'm not going to take too much time to go through it. But after Fukushima Near-Term Task Force recommendations and 50.54(f) letters, as an office we sent all the COL and ESB applicants a generic RAI asking them to reevaluate the seismic hazard based on the new models, which is in NUREG-2115.

And if there is any need to modify their

GMRS and update it accordingly. And in this specific case I think, even prior to our RAI, the applicant has already decided to use the new model. And he was saying a little earlier the results actually do vary, some levels. Some significantly in some frequencies and things. But this is a new model, this is an updated model.

With that change we had asked several RAIs, which really pertain to the EPRI-SOG models, they become defined, so we are not discussing that in that in the SER. We only maintained the ones that had some relevance, like the Mineral Virginia RAI initially submitted as mentioned, again, earlier to update for the FSAR models. Now it is an RAI on the update to Central Eastern US Models whether or not they're issues.

And at this point we have two open items. And these are probably open items pretty much on the staff's shoulders responsibility, around more in the confirmatory levels. And we'll go through them very quickly in the next few slides.

MEMBER STETKAR: Before you leave, I was going to wait but I think I'll ask it now. These new CEUS characterization in the NUREG. But they use the, as I understand it, the way it's characterized are the EPRI 2004, 2006 ground motion prediction equations with an update of the treatment of aleatory uncertainty.

We recently heard a presentation from the staff with regard to the Fukushima Near-Term Task Force issues, and in particular the EPRI Guidance about how to perform the site-specific hazard analyses.

And I thought we were informed that the staff has not accepted the use of those ground motion prediction equations because of concerns about their treatment of uncertainties in the document behind that process.

So does this SER now endorse the use of those?

DR. SEBER: No. This SER --

MEMBER STETKAR: Because I didn't see any questions about the use of those predictions equations, or an open item.

DR. SEBER: Well a couple of, I guess, questions on that. The current SER uses the NUREG-2115 Seismic Source Models and EPRI 2004, 2006 ground motion prediction equations. The way they stand.

And parallel, as you also suggested and said, because of Fukushima industry took the initiative to develop new ground motion prediction equations. We do not have yet, we do not have at this point the final documents and things. We had some initial responses, that's why the staff said well we don't have sufficient information to evaluate this.

And what we are hearing it's going to be coming later and then staff will take its time to evaluate. So that is a parallel effort independent of what the reviews happening here.

MEMBER STETKAR: But if it's a parallel effort that extends, as many things, out into decades of research, what implication does that have regarding the staff's conclusions on this particular application? Because they're using --

DR. SEBER: Sure. What we will do, because it is still 2004, 2006 is a valid ground motion prediction equations that we use in our regulatory system. It's an approved ground motion prediction model as of today. There's not replacement as of today.

So we'll make our judgment based on those ground motion prediction equations. Should the new one come in accepted and eventually make some difference, I think that's what ultimately heading to, then that has to be evaluated at that point.

But currently we are not in a position to do that. Because we don't even have the ground motion prediction equations. Nor do the applicant. And this is the nature of seismic hazard calculations. There's always updates. Like, you know, EPRI-SOG models needed to be updated and finally we have an update.

Ground motion prediction equations in 2004 updated, now with the current times comes again, 2013, we feel like it needs to be updated again. Can we guarantee that in ten years from now it's not going to be updated. That will be probably a stretch, it will probably require update.

As the scientific knowledge improves we have to catch up with that. But currently what is done is the best science, best knowledge and make the regulatory judgment at that point. Knowing that at some point in the future yes it may change. And it does happen actually all the time.

MEMBER STETKAR: Thanks, at least I understand your position. Given that, you heard the question I asked the applicant about the curious nature of the lack of uncertainty in the seismic hazard. And they alluded to the fact that that might be at least partially attributed to the EPRI Ground Motion Response equations.

Are you at all concerned that the uncertainties may not be appropriately characterized?

DR. SEBER: It is definitely something we check in our reviews. You can rest assured of that.

And that's one of the open items --

MEMBER STETKAR: Because I don't see any --

DR. SEBER: -- that's one of the open items that we have in the system, confirming the PSHA calculation results, we'll come to that.

MEMBER STETKAR: Okay. I read those open items and I didn't see anything that relates to uncertainty. I saw seismic sources. I saw treatment of Mineral, Virginia. But maybe I missed something, so I'll let you continue.

DR. SEBER: The open item refers to confirming applicants PSHA results. That incorporates not only the GMRS but also it incorporates sources, what sources they use, they're adequate levels and things. So that's one topic.

The second thing, what we see, what the applicant showed us as uncertainty, I think you were referring to the percentile differences and things. It is nothing different from what we have seen even in EPRI models. This is the nature of seismic hazard calculations.

MEMBER STETKAR: It's not the nature of seismic hazard calculations if you just think about uncertainty.

DR. SEBER: It is in this sense.

MEMBER STETKAR: If you can say that you have the same uncertainty about a seismic hazard as I do about the failure rate of a pump, for which I have hundreds of thousands of operating years' worth of data.

And that uncertainty, not only that the uncertainty is that small but that it's essentially invariant as I go out to accelerations and recurrence intervals that are well beyond our historical records.

And that, you might see that. But that calls into question, at least in my mind, about is the process that you see adequately accounting for the real uncertainties?

DR. SEBER: Couple of points. In the example that you gave you said there are a lot of observations. In this case, very, very limited observations. What is done is assumption based and model based.

So when you look at the ground motion prediction equations, they are very standard, very uniform shapes. When you look at the seismic hazard definitions they have very uniform shapes.

And when you add them up and you get the percentages and variations of these seismic hazard curves and come up with the 10th, 20th, 84th percentile of variations that become a natural outcome of the assumptions that you make in the system.

In the lack of observations that's what we rely on.

MEMBER STETKAR: Well thank you for confirming my concern.

DR. SEBER: Sure.

MEMBER STETKAR: My concern remains that if we're not characterizing the uncertainties correctly then we're not characterizing the seismic hazard correctly.

And from what you said, if we're basing our uncertainties on stylized assumptions, in general the uncertainties become larger when I use stylized assumptions compared to cases where I have a lot of actual evidence, data, that I can point to and count.

DR. SEBER: Yes.

MEMBER STETKAR: And you're saying, well because I used the stylized assumptions and standard methods these very narrow uncertainties, and the lack of variation in the uncertainty, are a natural outcome of that and I guess I would question that process.

And the only reason I'm raising it is that the entire industry, it's relevant to this particular application obviously, but the entire industry is now in the process of using these stylized calculations to re-characterize the seismic hazard for the vast majority of the plants in the United States.

DR. SEBER: Correct.

MEMBER STETKAR: And if there's something that is questionable about that process it seems that the staff should be interested in that.

DR. SEBER: We are very interested. And we're aware of the questionable items. But in the absence of observations we're doing the best we can. And that has been always the practice, I think, any engineering and science applications you do what you can given the knowledge that you have.

It is understandable that the uncertainty of what appears to be uniform across the board comes perhaps from the assumptions made, models used. But once you buy into PSHA kind of models and conduct PSHA calculations based on the knowledge that you have currently that is the natural outcome process.

MEMBER STETKAR: Thank you. I guess I'll have to look into those models and how they're used. Because I used to use those models about 20 years ago and we had uncertainties that were much larger and increased as a function of the lack of information.

And apparently now we know a lot more. So

I guess I'll have to go do some reading. Thank you.

DR. SEBER: Yes, we'll be happy to provide you, if you need additional information.

CHAIR POWERS: A question that we need to wrestle with sometime. When we take this information forward to the Full Committee it's going to be raised and the issue of revisiting the uncertainties associated with seismic hazard curves.

And I mean it's outside the charter of this committee here I think. At least I --

MEMBER STETKAR: No it's a more generic issue.

CHAIR POWERS: I'd say it is a more generic issue. Yesterday we had some other issues that came up that were more generic. This is proving to be a very prolific generation at work for the ACRS, but it's outside the confines of this particular review.

And so we may have a chat with you a little bit offline on what we --

MEMBER STETKAR: Yes, I thought if some of that lack of uncertainty was coming because of the use of the old EPRI Ground Motion prediction equations, which I thought I heard a little bit from the applicant, that's the reason I asked the staff about whether or not they were kind of holding off an endorsement of the hazard until the issue of the uncertainty and the current generation of ground motion prediction equations was resolved.

But they're not.

CHAIR POWERS: Yes, I wouldn't think it would be necessary, because the plant's extremely robust.

MEMBER STETKAR: Yes.

CHAIR POWERS: Well anyway, we as a committee need to decide on some strategy in communicating with full ACRS on what to do about this. Because I don't think it's germane in our particular mission here.

DR. SEBER: If I may, just one closing sentence. Is that definitely the process takes into account uncertainties at different levels. From the ground motions, source characterization, logic trees and things.

And that is built in to the system. But if you're looking for observation of evidence for it that is what is lacking in most cases, because in the Central Eastern U.S. we don't have very large earthquakes that produce very good data for us to do the ground motion prediction equations.

And our seismic models are adequate to

certain levels based on what we know now. Could be completely different. And that is addressed, like you have seen earlier in the applicant's slides too, a maximum seismic tectonic zones, RLME sources. All these represent different uncertainties in the system.

CHAIR POWERS: My recollection is in some presentations on this material before the Full Committee there was some intent to augment the observational database for CEUS with analog regions.

DR. SEBER: That is a very common practice in the ground motion prediction equations in the Central Eastern U.S.

CHAIR POWERS: So maybe we do need to understand a little more on that. But again, it's not an issue for you guys to worry about. It's an issue for us to worry about. Please continue.

DR. SEBER: Okay. Next slide please.

A similar slide was shown earlier. This is actually a picture from the FSAR, 200 mile zone shown with the seismicity, red dots. And earthquake sizes are proportional to the circle diameters, or radius.

Next slide, please.

One of the things that we usually do, even though NUREG-2115 relatively new model it does, it includes an earthquake catalog. The earthquake catalog is complete through 2008, and now we're in 2013 so there is some period of time passed.

So one of the things we've done, get an updated earthquake catalog just to see if there's any other new earthquakes that we would be paying attention to that might impact anything on the seismic source models.

We have done this for the what is called the Central Eastern Seismic Source Data Region, which is the complete area. Next slide, please.

And verified over 400 earthquakes larger than 3 between 2008 to now. Some of these are aftershocks that we would not normally use in PSHA calculations, but this is for information only purposes at this point to see whether or not an update is needed in some of the new models.

And what is shown on this slide, the red dots, actually there are five of them, three of them in Oklahoma on top of each other so it shows as one in this plot. Of course the most significant concern in this case would be the one in the middle of Virginia, which is very close to this site as shown in the red star.

And the 200 mile is the semi-transparent circle, actually it's a circle but on the screen it looks ellipse.

The reason we have to go through the whole Central Eastern instead of region because the new models actually used, like I said, as one of the potential sources in addressing the uncertainties in these areas, is the standard region seismic source which covers this outer polygon shown in light gray color.

Next slide please.

Among those analyses, not surprising to all, a Mineral, Virginia earthquake has the potential to impact the seismic hazard results at the site the most. Actually there was an existing RAI already and followed up on that RAI and how it would it would impact.

And applicant responded earlier saying that it does actually impact both the M-max and the rates. But M-max changes, M-max would be the expected largest maximum magnitude giving source.

But they were extremely minor, which we confirmed. As they are not going to make any difference. The applicant response also suggested that rate changes because of this magnitude 5.7 earthquake may impact the hazard in different situations up to 13 percent.

And at that time we didn't feel comfortable accepting the applicant's response because we did not have sufficient details in our hands to go through exactly what has been done. And, as earlier alluded by the applicant, we now have received very detailed analyses and how they reach this point. And we'll be evaluating that.

That is now the basis of the first open item. If you can go next slide please. And we will be evaluating that within probably the next couple of months and finally reaching the conclusion on this issues, on the first open item. So this is responsibility on the staff's shoulders now.

Next slide please.

In terms of seismic hazard evaluations because the Central Easter U.S. is a new model, and the first time these are implemented actually this is one of the first implementations.

In August of 2012 we did conduct what we call seismic software audit. We just wanted to understand the applicant's implementation of this brand new model into seismic hazard code. In that audit we did not go into discussions about seismic hazard results for Calvert Cliff, but specifically how they implement this new model into their existing codes and what changes needed to be done.

And the audit, you know, we did not identify any significant issues, but there was one leftover item that we said we were going to follow up. For those of you familiar with the NUREG-2115, it establishes new model and does the testing at seven test sites.

We usually expect the applicants to show us those seven test sites are adequately recalculated for their implementations of this code. We did not observe that at that audit so we wanted to continue in that area. And we requested applicant to send us all seismic sources hazard curves, individually.

And we will now go back, Tanya, if you go to the next up. And we will in a sense reconfirm completely what the applicant has done in the PSHA area. And that is the second open item in 2.5.2.

And to do that of course we have to have seismic software that does this completely. Up to now we've been relying on alternative software as doing more confirmatory analyses. This will be almost an effort of duplications of efforts.

We can now, we are not at this point ready to do that. Office of Research has established a contract, now they're getting a software for us to use it. We have the first part of the software, we are testing right now. And the second part should be coming in weeks.

So I believe in a couple of months we'll be in position to do the complete analyses and reevaluation, or reconfirmation if you will, of the hazard results. So that is why we have not done that. We have not confirmed applicant's PSHA results at this point. That is why it's an open item.

Again, it is an open item. Applicant has provided all the information to us, it is on our shoulders. We have the responsibility to finalize this one. Provided that we don't find anything we'll close the open item. If we find some significant differences well of course have to go back and communicate with the applicant on our findings.

Next slide please.

The third piece in the system that we usually validate is the site response evaluation. We always do our own confirmatory response calculations. And we've done several alternatives, the first one was using similar or same input parameters, as much as we could. Because there is a randomization in the process, we cannot duplicate everything the same.

And also some of the parameters used in the site response may be open to interpretations and we wanted to analyze and do some scientific studies. If they used slightly different numbers would that impact, would it impact too much or not.

And in generally we are confident that applicant's confirmatory result -- Of applicant's site response evaluation, adequately represented the site characteristics at the site. I'll show you a slide of that. Next slide please.

What is shown in red here is the site response evaluation. Looking at the vertical axis, Amplification Function. Whatever comes at respective frequencies in our example axis are amplified by whatever the red curve says. That applicant's response.

And our, NRC's response is the blue line. We don't expect them to be on top of each other because of the nature of what we do and the uncertainties in the system. And I haven't got it, unfortunately on this one, standard deviations that would be helpful. But it's not going to make that much difference.

What is shown, the red and the blue, applicant's and staff's site response evaluations, those are the median curves. Our Regulatory Guidance suggest we should do at least 60 randomization to site response, which means shear wave velocity profiles, variations in shear wave velocity profiles.

And there are procedures that we use to get the 60 median and this is the median shown here. Like I said, there are also other parameters like the effective ration and the duration of the seismic motion in used in these site response calculations.

These are numbers that we don't have a very good control. We know bulk number, where it should be, but it could be a little more, a little less and we do a little bit sensitivity studies. And those are shown in the dashed lines for each duration and effective ratio. They are what we call within the uncertainty limits. It's not going to change that much, the system.

As I've said, we don't expect a 1:1 match and that was the basis of our decision. That yes, the site response calculations are adequate for this site and this amplification function can be used by the applicant.

And the next, and I believe the last slide. Of course that concludes the 2.5.2, which is the establishment of GMRS response spectra. Eventually this is now fed into Chapter 3.7 where the engineers took it over and do the analyses.

And what is shown here is the final GMRS done by the applicant. And usually there's horizontal and vertical solid line is the horizontal GMRS and vertical is -- Perhaps one thing to note is that the new GMRS is above 0.1 G, that is a magical number in the regulatory space because Part 50, Appendix S says applicant's need to use at least 0.1 G in their PGA, in their shapes.

So the new calculations are above it. And, as you have seen earlier this morning, that actually applicant now is using 0.15 as their site SSC, which I do believe completely covers the GMRS at this level. So they have added, it's like conservatism, into the system from what we expect from a seismic hazard in terms of a GMRS and what is used as SSE in the structural design and analysis.

This is where I'm going to conclude. If you have questions of course, or further questions, I'll be happy to answer them.

CHAIR POWERS: Any questions for the speaker? Very clear, thank you.

MS. FORD: All right. Now, Dr. Wang.

DR. WANG: Good morning. My name is Weijun Wang. I'm a senior geotechnical engineer NRO. I have a PhD in geotechnical engineering. I've been working in the field over 30 years.

So I'm going to present the staff review on the Calvert Cliff COL Application, Section 2.5.4 and 2.5.5.

So first I'm going to talk about review on 2.5.4, which is Stability of Subsurface Materials and Foundations.

In this circumstance there are some site-specific information provided such as the property of the subsurface materials. The foundation interface. Geophysical surveys, excavation and the backfill. Ground water conditions. The response of the soil and rock to dynamic loading. Liquefaction potential. And the static stability.

By the way that's actually because the title static stability average it also include the dynamic stability here. All of the related information already provided in other subsection, such as the 2.5.1 and the 2.5.2.

In this section there are six COL information items. And also it contain two departures from the U.S. EPR FSAR, as I tell before, to the standard design with exemption request, for the minimum shear wave velocity and the differential settlement design requirements.

During the review of these sections the staff tried to confirm all the COL information items have been addressed properly. And also we try to determine whether the COL FSAR provided sufficient information and adequately evaluated the stability of the subsurface material and the foundation in compliance with the regulations.

I also would like to point out, like we do for all the other application review, we did a site audit. So actually we went to the site, we look at their site investigation, their samples and also we audit their calculations.

And also if we find any issue important to the stability of the subsurface material and the foundation we did all of the confirmatory analysis. For example, for this site we conduct the confirmatory analysis on the settlement.

Next slide, please.

So I'm going to give a very short summary of what the applicant provided in this section. And the UniStar already presented in detail, I just give you a quick summary. Those item at the top, very important role in the stability evaluation.

Basically the applicant determined material and engineering properties of the subsurface material based on both field and laboratory testing results.

Identified the load bearing layer and described the foundation interface, which are two very important factors when we evaluate the stability of the foundation.

Also provided the detailed information on the excavations and the backfill, including the extent of the excavation, the source and the quantity of the backfills. Compaction specification, in-place the backfill properties and the related to ITAAC.

This, you are probably aware of, because we have specific requirements for the material that underneath the Calvert 1's structure. So we are very careful about the actual will place in the field underneath the Calvert 1 structures. So actually we very much paid attention to what we did the ITAAC, just gave us some kind of assurance there.

The applicant also provided the liquefaction potential evaluation, which are indicators there would be no potential for liquefaction for this site.

Next slide, please.

You probably already saw this during the Antonio's presentation. This will give you the idea of the interface between the foundation and the supporting soils.

Next slide, please.

CHAIR POWERS: I can understand pretty well on this engineered backfill how you understand its properties when it's placed. I'm still trying to understand how you know what the properties are after you build a structure over the top of it.

DR. WANG: Oh, okay. First of all we have the design property for the backfill material. It could be soil or could be concrete, whatever the applicant would like to use.

So that's one thing. We have the design properties. And then when you actually place the fill you have to control the quality. Whenever, if your backfill is the soil then we have a specific, the ITAAC, for the compaction. So we will ensure the soil --

CHAIR POWERS: I can understand how, as it's placed, and as you build things you can go measure it. How do you know in the reviewing of this document, they say okay we're going to 790, it's going to go up to 1,050 and then we're going to put the building on top of it and it's going to change this way. How do you know that's true?

DR. WANG: Okay, the one thing we have, actually we have the rough measurement of the shear wave velocity of the backfill material. That will give you the real number, real values, or give you the real picture about how good the backfill material, in the field, really is.

So our definition is ITAAC for the backfill we have two ITAACs, one is about the compaction. Another one is about the shear wave velocity measurement. And that measurement actually it will be done when the backfill complete. Then the measurement will tell what's actually the shear wave velocity at certain depths.

So another way we will have a very good handle on what's the property of backfill material, in the field. Did that answer your question?

CHAIR POWERS: No. I mean what you're saying is after it's done I can measure it and it either complies or it doesn't comply. There's an awful lot of dollars got spent by the time. And it would be terrible if it didn't comply. Now that's the applicant's problem, I understand.

But how do you have confidence that what they say it's going to be is in fact what it's going to be? That's where I'm struggling.

Now maybe you have a lot of empirical data that says, okay if you use this particular material and it had 790 feet per second when it was placed, after I put a large building on top of it it's going to have 850 or something like that. I don't know what the number is.

DR. WANG: Okay, that's why we are very careful about the ITAAC, you know that --

CHAIR POWERS: ITAAC is after the fact. I'm trying to understand when you read it and the guy says it's going to be this. And you say, oh, okay, yes there's a good chance it will be that.

DR. WANG: And by the way if, after we do the ITAAC, if the ITAAC are meet the acceptance criteria and, for example, if the shear wave velocity meets the requirement when you actually build the structures the shear wave velocity will only increase because the shear wave velocity is also function of a combining pressure.

When you put more weight on the surface of the soil, and actually the shear wave velocity can only increase.

CHAIR POWERS: Please continue.

DR. WANG: Next slide, please.

And this section also estimate the soil bearing capacity using a different models. And the applicant chose the most conservative result for the design.

It estimates the total and the differential settlement of the foundation using 3D Finite Element Method.

It also discussed the uniformity of the subsurface material. And accounted for the variability of the soil property in the stability analysis.

The good thing for the geotechnical engineers as there are many uncertainties and the peak, sometimes there are big variation, the good thing is they're not likely in the seismic hazard evaluation. We can really see, based on the field and the lab tests.

We can really see what's the variation. And then we will have a very good handle on how to account for those variability and uncertainty in our stability analysis.

It's also calculated, the lateral earth pressure, on the foundation's structure to ensure it will meet the standard design requirement.

Next slide, please.

Based on our review and our confirmatory analysis we found that the applicant performed adequate subsurface exploration. And the soil properties used in design and analysis are determined based on both field and laboratory test results with consideration of variability of soil properties which reasonably represent the site conditions.

The bearing capacity of the supporting soil and the settlement of foundation and the both static and dynamic loading conditions are evaluated using adequate conventional and state-of-the-art methods. But the open item still remains. Later on I will discuss about open item.

We also considered the factor of safety used in the analysis and in the evaluation adequate. And also the procedures used in the analysis also, acceptable.

Next slide, please.

MEMBER SKILLMAN: Now let's go back to 39, please.

DR. WANG: Okay.

MEMBER SKILLMAN: Number 5, you communicate that you will estimate the soil bearing capacity and choose the most conservative. And my question is, what do you mean by most conservative? If you have a heavy building and the building continues to settle then your theorem is that the shear wave must go up because the soil is being compacted.

Here's my question. These buildings have shear keys, for sliding and overturning, and other design features that depend on the soil characteristics. And the soil characteristics are affected by the dead weight of the building and the equipment bounded in the building.

So when you say most conservative in 5, is that the heaviest dead weight of the building, plus its contents, compacting the soil? Or, is the most conservative the lightest building and the least compaction of the underlying soil?

And what I'm really wondering is about the design features, such as the shear keys for sliding and overturning, and the way in which the underlying soil is affected.

DR. WANG: Okay, actually your question has two parts. One is about what I mean here are the most conservative. And the second part is about the design or structure feature, will that effect to the evaluation. Like for the building capacity or like sliding, whatever.

Okay, the first thing. I said here the most conservative result was chosen is because the applicant actually used like three different models to evaluation the building capacity. And two of them are using the, we call it the general shear failure model. And they use the conventional method and also used the finite element model to do their calculation. To see what's the ultimate soil bearing capacity.

And they also used another model, because, for this site, the load bearing layer, the soil is divided into three sublayers. And it happen to be the top layer is stiffer than the layer below.

And then the applicant considered one failure model which we call the Puncture Failure, which means if possibility, because the load on the top layer the foundation may penetrate, like a punch, it's not like general shear failure. It failed like that way. It will go through the first layer and down to the second layer. They also considered that possibility.

And as they compared all the estimate, the building capacity values, they choose the smallest one. So that's why I said they chose the most conservative one.

And like I mention, the Puncture Failure Model, it is one possibility. It may happen, but it also may not happen in the field. But anyway they use several different models to consider what, they try to find out what the smallest building capacity actually they obtained after they did all the analysis and the calculations. So that's why I said that they used the most conservative result.

Okay, the second question about the effect of the structure design feature. First of all, like I mention, the shear wave velocity of the soil after you put all the load in there it actually will increase.

And in the analysis of the calculation we did not take that in consideration. We only use whatever the soil property designed for. And when we look at the design parameters and if the applicant they actually determined the parameter values based on both the field and the laboratory test results. And they come up with some value.

Sometimes it's the average or the mean value. Sometimes they consider, we call it like a lower bound value, which is actually smaller than the average value. In that way it's accounted for the uncertainties or the variations.

And the by the way, for the other, the structure feature in the stability analysis, like sliding and overturning. That part actually was done in the Section 3.7 and 3.8. .

MEMBER SKILLMAN: Thank you for your explanation. But the soil characteristics are material to the prevention in sliding and overturning, hence the reason I asked the question even though that is in Chapter 3. Thank you for your explanation.

DR. WANG: You're welcome. Next slide please.

I mentioned that there are two departures. One departure is about the requirement of minimum shear wave velocity of 1,000 feet per second underneath any Category 1 structure foundation.

And on this site, because some structure the foundation is a relatively shallow depths. And the backfill soil normally cannot reach 1,000 feet per second. Because of that so the applicant requested for, identified that as one departure under the credit for exemption.

And we look at their request and their evaluation. We found out actually they performed the site-specific analysis, which is actually the seismic bounds. And SSI cannot assess using the site-specific soil parameters. Like I point out here, the shear wave velocity is even below 700 feet per second.

And they base it on the original, the GMRS and the foundation input response spectra, we call FIRS. It was fine because the structure response were enveloped by the standard design spectra.

But, because now the seismic, the hazard source has been updated now so we need to look at the new seismic hazard response spectra. And then to reevaluate if this departure is adequate or whether the application need to do additional analysis. So that's for the departure, one departure.

Next slide, please.

And this departure is about the tilt, the settlement. It's also, because for the standard design it will require the tilt settlement, or differential settlement should be smaller than the rate of 1/1200. And for some structures the applicant predicts the tilt will be larger than this value, required value.

So because of that they did another analysis by using finite element model. In other models they proved, they model the foundation used this design, the basemat, which is six feet concrete there instead of using just one simplified model in the conventional calculation.

In the conventional method they treated the foundation path with a flexible plate. So you can imagine if you do that, it will be larger than you actually put down like six feet of the concrete basemat there.

So I put into there the new calculation, with finite element model calculation, they found out that they settlement for those structure foundations are actually was within the limit of the standard design.

So we look at that and we also did, in Sections 3.8.5 staff evaluates this departure. So the more details actually is pointed to that section.

Next slide, please.

Okay, I present this figure again to just give you an idea where those foundation will exceed the differential settlement requirement, what's the location of those structures.

Okay, next slide, please.

Open item. There's one open item, which is in this Section 2.5.4, lack of specific ITAAC on settlement control. This open item is based on the following considerations.

First the settlement is very important stability concern at any deep soil site. And we know that the Calvert Cliffs site is a deep soil site. And for any deep soil site the settlement will be a concern.

And also the uncertainties if not only related to the property of the subsurface material, it's also related to the model used in the settlement predictions.

And also I said is construction practices, which means like the construction sequencing and the variations of the construction that are actually happening in the field. Because those factors will effect the accuracy of settlement evaluation.

Another consideration here is because we have several different models to evaluate the settlement of this site. And we found out the results gave us quite a wide range of the predictions.

And because, you know, there is no one measure, no one measure that can give you the exact prediction of what will really happen in the field. No such model exists now. So because of that we counted, although the applicant, you know, we had back and forth, forth and back with the RAIs and the RAI response and the new analysis and so forth.

And also the applicant provided us very detailed settlement monitoring plan. And also provided the engineering measures just in case a larger settlement occur, what the measure could do in the field. We still feel we need some of assurance of this settlement issue.

And finally we thought the ITAAC would be one of the measure which will give us some kind of assurance. So in case the actual settlement in the field exceed the calculated, or expected, settlement. Because ITAAC in place, if that happen, which means the actual settlement if it's really clear it will exceed the design requirement then the applicant has to do something to meet the design requirement before they can finish the construction and the loaded field.

So I mentioned that, just try to explain why we keep this one as open item.

CHAIR POWERS: Suppose the settlement, and the applicant comes back and says by the time I actually construct this thing my settlement is going to be down. I'm going to be stabilized and it's not going to be very much.

And suppose it is substantial, and Dick raised the issue of buried cable and underground piping, which I presume that a guy could go fix. What other issues are there?

A nice uniform settlement. It's not tilting, you're not bending anything. Suppose, just figure then what?

DR. WANG: Okay, actually the tilting and settlement they are two measures. One is the structures. One thing is the structure, one thing is structure in the cell, which reflect the, we call the tilt.

Another thing is the differential settlement between adjacent structures. So then they have to meet all requirements. Because you cannot like, all structures has uniform settlement we do not, as geotechnical engineer, we do not really care too much about the uniform settlement. We really care about the differential settlement.

So even a like two structure, two buildings, have the same uniform settlement, because the one building is larger, heavier and the other one is smaller, this will still have the difference settlement that they are.

In other words the differential settlement between the other two building, if that differential settlement exceed the requirement it still will create some problem, like for the piping. It still will create problem.

But if they can control that then we will be fine. You'll have like two feet of the settlement --

CHAIR POWERS: Okay, let me ask you another question. Build a big building and I've got a bunch of little buildings out here. The big building settles more and so the little buildings now are tilted. Discount the piping and the cabling issues because we have faith you can fix that. Okay, is there any other problem?

DR. WANG: Okay, that's one thing we can control during the construction. For example, we will build the heavier building first. Let it settle more and then build the lighter ones later.

So in other ways, and you try to control the differential settlement. So in other words we are talking about the construction sequences.

CHAIR POWERS: All right. I understand.

DR. WANG: Next slide.

There is another potential open item, because they, this is under Design, which increased the requirement for the static bearing capacity. So now the UniStar is evaluating option to either meet the value in the revised standard design or determine whether a departure will be needed.

Okay, next one.

Okay, that will be the staff evaluation for Section 2.5.4, before I continue is there any other questions.

Okay, the Section 2.5.5 is regarding the stability of slopes. This is a very simple one. And there's only one COL information item. The applicant addressed that. And also the applicant did the slope stability analysis on both the natural and man-made slopes at the site.

And the conclusion is that all the slopes will have adequate failure safety, or in other words it will not fail during the life of the power plant. So, therefore, they will have no adverse effect to the safety of the nuclear power plant. So that was our conclusion.

Okay, that will be the end of my presentation. Any questions?

CHAIR POWERS: Any questions? Dr. Schultz.

MEMBER SCHULTZ: I think with regard to the settlement control that there seems to be an important item here. You really, in fact, don't feel you've gotten enough information from the applicant to determine that a plan is in place that you're satisfied with.

DR. WANG: Yes, so far my present feeling is we have enough information here. It's just like for the settlement issue, just there is no better way to ensure anybody what the real settlement will be when the power plant, the other buildings are actually built. So that's why we keep this as open item. We're trying to find a way to give us a better assurance.

And, okay, another thing is although, based on all the predictions and calculations for this site, the Calvert Cliffs site, settlement will be, the current existing reactors, Unit 1 and 2, so far there is no indication of settlement, differential settlement, produced any problems.

Well of course the technology used for Unit 3 will be different from the Unit 1 and 2. We cannot say, okay, because 1 and 2 so far have no problem then Unit 3 will be okay. No, we cannot say that. That's why we are very careful about this issue.

MEMBER SCHULTZ: Are you talking about the construction technology? The building construction technology? Or are you talking about the soil compaction?

DR. WANG: I'm talking about the different designs. Different designs. And for Unit 3 we'll use a new design, it's an EPR design. Which will be bigger and heavier.

MEMBER SCHULTZ: Thank you.

DR. WANG: You're welcome.

CHAIR POWERS: Any other questions to pose to the speaker.

MS. FORD: Well, hearing no more questions, this concludes our presentation on Chapter 2, Section 2.5. Thank you for your time. And thank you, Staff.

DR. WANG: Thank you.

CHAIR POWERS: We're done with this, you didn't have any closing comments on this?

MR. ARORA: Right now it's Chapter 13, it's scheduled at 1:30, Dr. Powers.

CHAIR POWERS: And we will recess until 1:30.

(Whereupon, the hearing in the above-entitled matter went off the record at 11:52 a.m., and resumed at 1:28 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:30 p.m.)

CHAIR POWERS: Let's come back into session. We're moving on to Chapter 13. There are eight sections in Chapter 13. One of those, dealing with security, will not be addressed as it's outside our charter. So we're not going to address security, okay. With that, I think we can turn it to you, Mark.

MR. FINLEY: Okay, thank you again, Dr. Powers, and good afternoon once again. Let me go to Slide 2 here, quickly, Wayne. We're going to use the same format that we used this morning in other presentations where we'll emphasize the supplemental information for Calvert Cliffs, even though we use this "Incorporate by Reference" methodology where we don't repeat what's in the design certification. In fact, the AREVA meeting for Chapter 13 was done a while ago, back in November of 2010.

High level for Chapter 13 on Slide 3. We have no ASLB contentions and we have no departures or exemptions in Chapter 13. There are 12 COL information items and we'll touch on those this afternoon.

And by way of introduction of my team here, so again, Mark Finley from UniStar. The committee knows me from this morning. But I'm supported by Doug Schweers, our security manager at UniStar, by Mark Hunter who is the director of operations and maintenance, and Scott McCain, consultant, expert in emergency preparedness will support with respect to the emergency preparedness discussions. Of course, Wayne Massie on the keyboard here.

On Slide 5, Dr. Powers said we have the sections, the agenda. We're not going to discuss Security Section 13.6. I would like at this time though, for a scheduling reason, for us, since we have an AREVA representative on the phone to discuss, or to support us in case there are questions relative to cyber security, that we go to Section 13.8 now. We just have one slide on cyber security.

CHAIR POWERS: I think that's just fine, if it makes it convenient for people. Does that mash with you, Arora? He wants to skip forward to 13.8.

MR. ARORA: Oh, he wants to go first to 13.8?

MR. FINLEY: And then I'll come back. Then I'll come back.

MR. ARORA: That's fine.

MS. WEAVER: Just quickly, our phone is a listen-in only mode. Do we need to adjust that?

MR. FINLEY: No, that's fine. If there are questions then there will just be a delay in response, if we need to use --

MS. WEAVER: You just let us know.

MR. FINLEY: Okay. Okay, so let's do that, 13.8. That begins on Slide 31. Here's just the title. Slide 32 is the one slide we have, and I'm going to ask Doug Schweers to address that slide.

MR. SCHWEERS: Our cyber security plan is based on Reg Guide 5.71 Appendices Alpha, which is under new bills, the standard for the cyber security plan. Because it's a part of the Reg Guide, our plan is the same as all new applicants' plans. It's a public document. It's very straightforward and very complete.

So it discusses our digital computers, our communication systems, and it addresses critical digital assets. The plan is written around critical digital assets and how we protect them. Again, we're implementing part of the plan which is 5.71.

The critical digital assets which will be addressed, as the I&C develops their systems the critical digital assets will be footprinted during that period of time. And again, it's a program that was well worked with the NRC, developed over a period of time and in conjunction with NEI.

MR. FINLEY: Let me ask if there are any questions regarding cyber security. We have just the one slide here.

MEMBER STETKAR: I do, and I'm not sure when to ask it. You can tell me whether I should ask it at a different time, Mark. I looked at your slides and I know you have a presentation on the overall organization. And when I was reading through the organization area there is a discussion about UNE's responsibility, it's under information technology.

But I wanted to understand that a little better, because one of the bullets that it does, it says that UNE is responsible, not UNO, for providing accessibility to all data gathered or generated during all phases of the plant life cycle, yada, yada, yada, protecting sensitive data with appropriate cyber security, regulatory compliance. Because I'm not quite sure how the organizations interface, I'm not quite sure what that implies for cyber security protections.

I recognize you have a cyber, I know what the cyber security plans look like. I know what the requirements are, but those plans are typically organized around the fact that the owner/operator of the facility, the licensee, UNO, to my understanding, maybe that's where I'm not understanding it correctly, is fully responsible for cyber security, not some other organization.

So perhaps that's why I wasn't quite sure when to ask it, but because it does touch on cyber security I thought I'd bring it up.

MR. FINLEY: Well, maybe I'll try to give a brief answer now, and if that's not enough we'll talk more about organization later. So it's a bit complex, the organization description for UniStar. And UNE is the overall responsible organization.

There's a chief executive officer at the top. He's actually responsible for what I'll call the project organization, which includes construction of the site and perhaps other sites too, and the operating organization which is UNO, and UNO is actually the licensee for the Calvert Cliffs Unit 3.

So there is, and Wayne probably helps me to talk about this, to Slide 9 here, shows the UNO.

This shows, you're right, the UNO organization coming underneath the UNE president and CEO, okay. So that UNO organization is the typical operating organization that you're familiar with in terms of not just the site vice president but also technical support, operations support and so forth. The concept behind this UNO corporate organization is that we would have a fleet of plants --

MEMBER STETKAR: UNO?

MR. FINLEY: UNO. The UNO operating organization would be responsible for perhaps more than one plant, so this is sort of a skeleton corporate operating organization, okay. And the --

MEMBER STETKAR: The analogy would be something like in Exelon.

MR. FINLEY: That's correct. That's correct. And Constellation has a similar organization. Now UNE, being responsible for construction as well as UNO operations is, like I said before, overall responsible for everything UniStar which includes construction and operation.

So there are elements of the corporate organization, like IT, for example, that would be umbrellaed under UNE that are not a part of UNO, the operating organization. And I think it's just a matter of choice. It could be that we have elements of IT under UNO as opposed to UNE, but our choice right now is under UNE.

MEMBER STETKAR: I had a few questions about organization, but since we jumped to cyber security first my biggest question was actually in that area, whether or not that the responsibility for cyber security being at the UNE level rather than UNO, does that introduce any potential vulnerabilities?

MR. FINLEY: I think not, and what I was going to go on to say is you would have personnel on site to support programs for the site, if the programs are applicable to the site, and of course cyber security would be applicable to the site. You would have personnel at site, and also at corporate whether it happens to be UNO corporate or UNE corporate that would be supporting that program.

Functionally, it really doesn't affect how the program is implemented. You still have to have, you know, the right people in the right places to oversee the program. And all the programs that apply to Calvert Cliffs would have people responsible for those programs, and it could be under the corporate organization or it could be under the site organization, specifically.

MEMBER STETKAR: When you say corporate

there, you mean UNE corporate or UNO?

MR. FINLEY: I actually mean both, I mean both. IT, like I said, IT, I think the decision now is to have IT under the UNE umbrella, and that's, I think, because IT is important, very important for the construction and design phases.

MEMBER STETKAR: I understand at some level, but once you get into the post construction operation of the plant when the cyber security plan is actually implemented, that broader responsibility or those broader linkages become, I don't know whether they're less important, but a potential vulnerability in some folks' minds.

MR. FINLEY: Understand it. So just from a practical standpoint, we would have an IT group at the site. That IT group would be matrixed to the site management, although reporting administratively to a corporate management under UNE.

So whether it's a matrix type reporting relationship or a direct administrative type reporting relationship, from a programmatic standpoint shouldn't make a difference.

MEMBER STETKAR: That helps a little bit, because as I said, I was just reading the words and trying to fit all of the different players together.

MR. FINLEY: I know it's complex, okay.

MEMBER STETKAR: Thank you.

MR. FINLEY: Any other questions on --

MEMBER SCHULTZ: Mark, just so we're clear here. The way that chart is showing -- sorry, Wayne. But the way that chart is showing, what you seem to be describing would be under the UNO senior vice president, though a function which would be corporate IT, for example, where would that fit? Would it not be in technical support?

MR. FINLEY: I think we would have a choice. So there's sort of a parallel organization I don't describe in detail here.

MEMBER SCHULTZ: Under UNE.

MR. FINLEY: Under UNE, okay. And we would have the choice whether to put --

MEMBER SCHULTZ: It could be over there.

MR. FINLEY: That's correct. So yes, it could be under the UNO umbrella, and it would, I think you're right, be under this vice president of technical support, if it's under the UNO umbrella.

MEMBER SCHULTZ: Okay, I got it. Thank you.

MR. FINLEY: Any other questions on cyber security? Okay, good. Then I suggest we go back to

Slide 6, which goes back to, well, we began the discussion but we'll start at the beginning on organization, essentially, Section 13.1.

And Slide 7 talks first about, of the COL item, information item, relates to the applicant needing to describe site-specific information related to management, technical support and operating organizations. And we'll start with the president and chief executive officer of UNE.

So this is the highest level, if you will, of the UniStar entity. And as I said before, responsible for operations of all of the nuclear reactors underneath UniStar, and that would include Calvert Cliffs Unit 3, obviously, any technical administrative support, also the siting, design, fabrication and construction of any units under construction.

So this is the additional element that's not normally a part of an operating organization where I separate UNE responsibilities from UNO responsibilities, and I'll talk more about UNO. And then of course setting and implementing policies, expectations for the UniStar organization.

Okay, and Slide 8, this now talks about UniStar Nuclear Operating Services where I'll spend a little bit more time, and we have the org chart that we've visited already. This is the organization focused on operation. This is actually the licensee for Calvert Cliffs Unit 3. They will be the owner's agent for the plant that would accept the systems during construction. So not responsible for the whole construction project, but in terms of turnover of systems to UniStar, they're responsible for that acceptance of systems.

And they'll be commissioning, operating and maintaining Calvert Cliffs Unit 3 where we're going to use a standardized set of procedures that we build by utilizing lessons learned from other EPRs. And they'll be responsible for training operators and other manpower for the startup and testing, commissioning program for Calvert Cliffs Unit 3. And they would also be responsible for performance improvement and quality control oversight at the site.

Okay, and then back to this organization chart on Slide 9.

CHAIR POWERS: It strikes me that UNO will at the start have a tremendous flux of talent switching over. I mean, the people that do acceptance are different than the people who do startup, testing and commissioning, typically.

I mean the skill set's different. I suppose there are a few people that have most skill sets, and certainly people can learn the type of skill set. But typically you would have different people there, so there's quite a flux of people in and out of this organization.

MR. FINLEY: Yes, and of course the staffing for the Calvert Cliffs plant is going to be a challenge. There's no question about it. We actually have a slide, Dr. Powers, if you can wait. When we get to Section 13.2, I have a slide that talks more to the staffing plan and we can talk more about your point then. But yes, we do have a staffing plan that includes the hiring and training phase in time to support acceptance of systems.

CHAIR POWERS: And especially this function of learning from other EPR facilities, because that i.e., some diverse locations, none of which are in the United States.

MR. FINLEY: Yes. And of course we will be participating both in the construction and commissioning phases. We are participating in the construction phases now for the EPRs under construction in Europe and China, especially due to EDF's involvement with those projects as well as with the UniStar project.

CHAIR POWERS: Yes, we've got some information on that.

MR. FINLEY: That's correct.

CHAIR POWERS: But the challenge on anything like this is, most of those countries have very, very different cultures, engineering cultures, and lessons that they learned may not be transferable, you know. It's really interesting. It's not directly applicable because the American experience is just different.

MR. FINLEY: I agree. We will also of course pay attention to the applicable lessons from the construction and staffing of projects in the U.S., Vogtle, Summer. We will monitor those and incorporate lessons learned as an industry in the U.S. as we can.

CHAIR POWERS: Yes. No, those tend to be higher level kinds of --

MR. FINLEY: Right.

CHAIR POWERS: -- you know, because the specifics are not applicable. But yes, first of the kind engineering is a problem everywhere, and skill services, nuclear services are short. There's a shortage of them in the country for everybody.

MR. FINLEY: And I think the key is, as you alluded to, is to find experience. We're not going to be able to hire all experienced --

CHAIR POWERS: That's right.

MR. FINLEY: -- people, but to find a mix of experience and junior individuals to staff the plant. But you have to have some experience.

CHAIR POWERS: Yes, you want the mix because presumably this plant operates for a while.

MR. FINLEY: Right. Okay, back to Slide 9 and the organization. So again this is sort of a typical corporate operating organization. The chief nuclear officer would be within this organization. This UNO senior vice president and chief nuclear officer would be the single individual responsible for nuclear safety for Calvert Cliffs Unit 3 and any other nuclear reactors that might be under his purview.

And then in terms of his direct reports, you would have the site vice president for Calvert Cliffs Unit 3. You would have a director of quality and performance improvement, vice president of technical support, vice president of operations support and administrative support. And as I said, this is more or less a typical type of operating fleet organization that you might find at Exelon or at Constellation.

MEMBER STETKAR: Mark, I'm not as familiar with details of how those organizations run their daily operations, if you will, because I tend to focus on operations. I wanted to ask you, under that vice president, operations support which is a UNO fleet, if I can call it that, function, in the FSAR it says that one of the functions there is, it says the operations support department is made up of both licensed and nonlicensed personnel and can supplement shift operations if needed.

Is that a corporate level pool of licensed operators that you can send to Calvert Cliffs or Plant XYZ or Plant ABC on a whim's notice and put them on shift?

MR. FINLEY: So I'll let Mark talk about this in a second, but certainly the last, it's not something that would normally be done, okay. I think --

MEMBER STETKAR: I'm trying to find out, abnormally, when people get into troubles is what I'm interested in.

MR. FINLEY: Yes, so it would be on a whim as you suggest that this pool of operators would be used to supplement the staffing at the site itself. But I think in those abnormal situations that pool could be used, and I'll ask --

MEMBER STETKAR: So licensed and nonlicensed.

MR. FINLEY: That's correct.

MEMBER STETKAR: So you'll have a pool of operators who are licensed for all of the facilities? Calvert Cliffs, Plant XYZ, Plant ABC, Plant 1234, and they can go to any one of those and walk into the control room and assume duties --

MR. FINLEY: There would be qualifications specific to the site. Of course, each site has site-specific equipment --

MEMBER STETKAR: Yes, that's my concern.

MR. FINLEY: It's going to be slightly different, so the qualification process would have to be there for both licensed and non-licensed operators to be able to stand in, if you will, at that site. So I think --

MEMBER STETKAR: Let me ask you this, because as I said as a preface I'm not familiar with the way other fleet operators perform this function. Do current fleet operators do that?

MR. FINLEY: I'll have to ask Mark.

MR. HUNTER: The way the corporate structure is, is you would have somebody trained at the site, like me, I have my senior license at Calvert Cliffs 1 and 2. In the corporate role, my role would be to oversee the day-to-day operations, see what they're doing. If something were to happen, I would go down and give technical support for that function. I could not, if I kept my license, went to training, did my requal and stood my, well, I could go down there.

If I don't, if I just maintained the fact that I had my senior license for a long time, I could go down and be in the, it's called an issue response team, IRT, or whatever you want to call it, IR team, I go down and provide my technical support. I could not actually function as an operator unless I kept my license and kept my training.

And that's the best part about it is, as people get more experienced and they're allowed to go to this corporate level organization, in a standardized fleet the goal would be to have most things be identical. So that if you did have a problem, and you see it now even with non-identical plants.

Just like Constellation's doing now. They go up to Nine Mile Point which has a totally, it's a BWR not a PWR. They have corporate level people that have their senior license, go up there and they provide technical oversight and direction. But they cannot walk into the control room as you're pointing out and operate or control something. They wouldn't be starting pumps and starting pumps like that, no.

MEMBER STETKAR: That was the genesis of my question, is I've seen organizations where people have license, you know, the cold license. They maintain an SRO, for example, but I don't want them walking in a control room and assuming control because I'm short staffed.

MR. HUNTER: That's correct.

MEMBER STETKAR: Because they don't have the day-to-day knowledge of what's going on in the plant. They don't have the actual hands-on operating experience.

MR. HUNTER: And in your corporate level just like, and I don't want to get into their business, but like during the strike their whole staff was not allowed to come to the site. So they had corporate level people that were trained at the site, went to the site and performed day-to-day duties. They did not actually operate the plant. The operators did that.

MEMBER STETKAR: I understand. I went through a year strike at a place where I was in that, so I understand.

MR. HUNTER: Yes.

MEMBER STETKAR: But it's one of my concerns of not having corporate people stand watch --

MR. HUNTER: Yes, you won't see that.

Unless of course I had my senior license and I was going to requal and standing my watches during the year, then I technically could be able, but I don't know why I'd ever want to.

MEMBER STETKAR: Okay, thank you.

MR. HUNTER: You're welcome.

MEMBER SCHULTZ: You, Mark Finley, you mentioned earlier that, the impression I had was that the umbrella organization would have the capability and responsibility for perhaps training, hiring training operators for future plants? Is that correct, and if so, where does that function happen within the structure of the organization?

MR. FINLEY: Okay, so in terms of staffing of the plant for the, I would say, operational staffing of Calvert Cliffs Unit 3 that would actually fall under this UNO organization, and it would fall under whichever functional VP on this Slide 9 has the ownership of that --

MEMBER SCHULTZ: And that's what I was trying to figure.

MR. FINLEY: -- technical function.

MEMBER SCHULTZ: Is that operation support or is that the site vice president?

MR. FINLEY: Right. So that would be

operation support. That would be operation support for the operators.

MEMBER SCHULTZ: Okay.

MR. FINLEY: Yes.

MR. HUNTER: Basically what you'd have, say you had five shifts of operators and you knew you were constructing the next plant. That five shifts would turn into six shifts and you would train another whole section of shifts so you had a pool of people that would be able to go on to the next plant and start training the people at the next plant.

MR. FINLEY: Yes, we especially think that in terms of the challenge for us we were talking about before of hiring and staffing and training the first crew, if you will, that's going to be a function that we want to give the site some corporate support to implement.

MEMBER SCHULTZ: Okay, thank you.

MR. FINLEY: Okay, moving to Slide 10 and focusing on the site organization. I believe there's a figure coming here in future slides, and we'll allude to that. But the site organization involves operations, maintenance, radiological protection, chemistry, work management, engineering, et cetera. You will have sort of a standard site organization with the groups that we are familiar with in terms of plant operation reporting to the site vice president.

And this site organization is also responsible for ensuring quality assurance and implementation of all administrative controls necessary for nuclear safety and industrial safety and radiological protection. Responsible for your corrective action program, essentially, for reporting problems with plant equipment, et cetera, and ensuring that proper procedures are used when required.

And Slide 11 talks to specific responsibilities for the site vice president, and I think this is familiar to most here, but has overall responsibility for operations at the site. Responsible, obviously, for nuclear safety, quality assurance program implementation, management of site reliable operation.

Responsible for implementing all the regulations that apply at the site. Has direct reports including the plant general manager and the manager of engineering, and the manager of training and performance improvement. There will also be an independent review committee that supports the site vice president in an advisory role.

And if you flip, probably be beneficial to flip to Slide 13 now just to view the site organization. It shows the site vice president coming underneath that chief nuclear officer I mentioned in the UNO corporate organization. And then supported by a manager of engineering, plant general manager, a manager of training in the typical site organizations.

For the site there will be a site director of quality, but he is matrixed, actually, to the site vice president and he administratively reports to a director of quality and performance improvement in the UNO corporate organization. And this org chart also shows the independent review committee that would be advising the site vice president on nuclear safety matters.

And it also shows the site commissioning manager who is matrixed to the site vice president during the commissioning process. The site commissioning manager actually would report directly up through the UNE corporate organization in terms of his responsibilities for the project, the construction project and overall completion of construction and testing.

Okay, no questions about the site organization. I think we skipped over Slide 12, so we should probably go back to that. So this talks a little bit about technical support for the site, and this is one of those direct reports in the UNO fleet organization, if you will.

It's based on the concept that we do plan to have a fleet of U.S. EPRs. Right now we have only two EPRs active of course, Calvert Cliffs 3 and the Bell Bend site are the active projects. Two EPRs are currently under construction as we talked about, in Europe, and two in China.

And this technical support organization provides feedback and will provide feedback, both construction feedback and operational commissioning feedback, to UniStar. Obviously we have an NSSS supplier that's common between the projects, and we expect to give feedback through AREVA in terms of specific technical issues related to the fuel and/or NSSS, et cetera.

Okay, I think that's what I had in terms of organization. Before going into training, let me open it up to any other questions about organization.

MEMBER STETKAR: I had a couple, and I don't think you're going to touch on this so I'll ask them now. There are a couple of tables in the FSAR, Table 13.1-1 and 13.1-2 that outline plant level staffing and shift level, shift crew composition.

One question I had is just kind of a

curiosity, in 13.1-1 where you talk about the number of maintenance technicians that you have on site, there's a footnote, 8, that says the UNO maintenance technicians are trained and qualified for both electrical and mechanical maintenance.

MR. HUNTER: That's correct.

MEMBER STETKAR: You list kind of 45 electrical and 45 mechanical, but I'm assuming that because of that the total number is really 45, it's not 90.

MR. HUNTER: Well, it's not going to be 90 but it's not going to be 45 either. There will be some electrical skills that we will not train --

MEMBER STETKAR: I was going to say, I've never quite seen that ever work very well.

MR. HUNTER: Our goal is to be able to have a mechanical maintenance person do basically electrical troubleshooting, basically rack in and rack out breakers, do system alignments electrically, but when it comes down to actually fixing something that's broken like rewinding a motor or taking the windings out, that kind of stuff, that won't be their purview.

MEMBER STETKAR: For regular on-shift staffing, I was trying to follow some of the RAIs and things, make sure that I understand it. It's now planned to have 24/7 coverage with one, I'll call it a maintenance, mechanical, electrical for --

MR. HUNTER: Well, you'll get one of each. You'll get one mechanical, one electrical, and one I&C. All three.

MEMBER STETKAR: All three bodies.

MR. HUNTER: Right. And those bodies, in my training program hopefully each of those bodies will have some overlap in doing things.

MEMBER STETKAR: I could identify through the string that you'd have at least two. I'm glad to hear you'll have three.

MR. HUNTER: Yes, our intention is not to have my I&C doing motor alignments, but if --

MEMBER STETKAR: You know, that discipline is clearly different especially with all the digital stuff, but I was just curious about the other, you know, motors and pumps and pipes and dials and that sort of stuff. Okay, thank you.

MR. HUNTER: You're welcome.

MEMBER STETKAR: That helps that. Now the more difficult one, I think. If I look at the minimum shift crew composition in 13.1-2, I notice that it lists a shift manager SRO, senior reactor operator SRO, and shift technical advisor, one of each.

And then there's a footnote that says, "The senior reactor operator on shift who meets the qualifications for the combined SRO/STA position specified in Option 1 of the Commission's policy statement on engineering expertise on shift may fulfill the STA position. The STA position may be eliminated for that shift if Option 1 is used."

So let's just assume that I do that. That leaves me two SROs on shift. I also know that the UNO shift manager acts as the emergency director, so that SRO has now site level responsibilities if I have a problem that requires me to implement the emergency plan.

And I know that you proposed at least extending the response times for offsite augmentation from a nominal 30 minutes to 60 minutes. So now my one SRO is serving as an emergency director for up to an hour, which leaves me one SRO to guide actual hands-on plant response to an emergency, and at the same time fulfill a nominally independent technical oversight function that the STA has fulfilled.

How do you meet the functional requirements of an STA in that sort of situation, where somebody who is actually directing the activities is also fulfilling the role of the STA? Because the other SRO cannot fulfill that role.

MR. HUNTER: That's correct.

MEMBER STETKAR: He's way too busy doing other things, for an hour. I mean we're not talking five or ten minutes here, we're talking an hour. And by the way, the hour says 60 minutes as long as optimal travel conditions exist.

So for example, if I had, oh, let's say a hurricane come through and it's probably not optimal travel conditions, or like a big seismic event, it might be a while where you have these two people trying to do an awful lot. So that sort of got my attention.

MR. FINLEY: Maybe we should refer to Scott as far as the functioning of the staffing analysis that was done.

MR. MCCAIN: I don't have a copy of the table -- can you hear me?

MEMBER STETKAR: Yes, you have to identify yourself.

MR. MCCAIN: My name is Scott McCain, as emergency planning side of it, and I worked on the staffing analysis that was put into the plan as a basis for it.

(Off microphone comments.)

MR. MCCAIN: Right. Well, that's the

table for operation. The operation table I'm referring to is in the emergency plan, which is the emergency response organization. And I'd like to see that first, but --

MEMBER STETKAR: We don't have the emergency plan. I've garnered the 60-minute response time. The responsibilities are clear for the emergency director in both places. The 60-minute response time, I've garnered that from the SER which talks quite a bit about the emergency plan. I have not personally looked at the emergency --

MR. HUNTER: It is what the emergency plan says.

MEMBER STETKAR: I'm just concerned that if I have two individuals, and only two individuals on shift with senior reactor operators licenses, and one of them must fulfill the duties of the site level emergency director which can get pretty involved in any real --

MR. HUNTER: That's correct.

MEMBER STETKAR: Any time you really need that person that person is really involved, for up to an hour. It strikes me that the basic function of any technical oversight, meaning a different set of eyes and a stand-back understanding from the actual hands-on detailed operation --

MR. HUNTER: And I know the way the words are written would lead you to believe that the STA position is succumbed by the SRO guy. There are still a person fulfilling that role. So it's still three people. You still have your shift manager. You still have your SRO.

An STA can be someone that is hydraulically, mechanically, and trained on the unit, correct, in accordance with Commission policy? It doesn't have to be a fully licensed operator. So you can have an SRO who is your STA.

MEMBER STETKAR: Yes.

MR. HUNTER: So you don't lose that position.

MEMBER STETKAR: Well, the words say --

MR. HUNTER: I understand --

MEMBER STETKAR: -- the STA position may be eliminated. Now that seems to be pretty clear that it says --

MR. HUNTER: I can't argue with what the words say. I can just argue with the way it would be in real life.

MEMBER STETKAR: The reason I raise this is that, you know, there's obvious concerns, but plants have operated with the minimum shift crew composition in the past, for a variety of reasons. I mean you can say all you want.

Monday through Friday day shift you might have some extra people hanging around, but for a variety of reasons as long as you meet the letter of the operating license you can get down to this minimum shift standard which, in my interpretation anyway, can leave you with two and only two SROs, one of whom is nominally the STA, and one of whom is nominally the shift manager who is, by definition, the emergency director.

MR. HUNTER: And I can't argue that that's the way the word, the way it's technically written.

MEMBER STETKAR: Okay.

MR. HUNTER: Like right now, since I don't have an engineering background, I'm not a mechanical or hydraulic engineer, I can't be the STA on shift. If I were to meet the Commission's policy statement on engineering expertise and I got my SRO license, then I could be an STA on shift, and tomorrow I could be the SRO.

MEMBER STETKAR: But according to this, today you could be both of those people, right? You could turn your head one way and say, I am the SRO, and turn your head the other way and say, I am the STA, because this seems to say that --

MR. HUNTER: I'm qualified to be the STA, and I'm qualified to be the SRO, but I still have to have two people. I cannot have an independent overview of the problems in the plant without having someone with that qualification.

MEMBER STETKAR: I'm glad to hear you say that because I agree with you. But if I read the words here and interpret them literally about eliminating the position --

MR. HUNTER: I understand.

MR. FINLEY: Mark, we're going to have to take --

(Simultaneous speaking.)

MR. HUNTER: No, I understand. Since I'm an operator that has my senior license, I read it the opposite way. It means that if I were to go back to school, get my mechanical degree and meet the STA requirements in accordance with Commission policy, I could go down on shift today. I could be the STA today, tomorrow I could be the SRO in another unit. So --

MEMBER STETKAR: I met all of those qualifications.

MR. HUNTER: That's correct. Well, that's good.

MR. FINLEY: I think Dr. Stetkar is correct though. The words say that the position might be eliminated, so I think we have to clarify that, correct it if it's incorrect.

MR. HUNTER: That's correct. I understand that.

MR. FINLEY: So we'll take an action --

MEMBER STETKAR: Thank you.

MEMBER SCHULTZ: Do you have another one, John?

MEMBER STETKAR: No.

MEMBER SCHULTZ: Mark, where does the corrective action program sit within the chart? I have an idea but I'd like to have it confirmed.

MR. FINLEY: Let me get to my notes here. I'm not sure. Yes, so I don't have --

MEMBER SCHULTZ: It's going to be under the site director of quality performance.

MR. FINLEY: I was going to say that. Quality performance and improvement director at the site.

MEMBER SCHULTZ: Okay.

MR. FINLEY: So on Slide 9 --

MEMBER SCHULTZ: I thought it might be a direct line to the site vice president rather than a dotted line.

MR. FINLEY: Fair question. No, it's a dotted line.

MEMBER SCHULTZ: I thought it was under the training and performance improvement manager or director. I thought that would be a good place for it, although it's a huge amount of responsibility. But I just did think it would be a direct report to the site vice president.

MR. FINLEY: So let's take an action to confirm there. As Mark said, currently our corrective action program is under our quality and performance improvement organization. We need to confirm that in the site organization it would stay in the same place. We'd have to confirm that.

MEMBER SCHULTZ: Thank you, and I appreciate that.

MEMBER SKILLMAN: I do have a question. In your SER Chapter 13.1.2.2.1.2, you've got your manager of engineering reporting to the site vice president and also to the UNO vice president of technical support.

And for those of you who have been in that role onsite, you quickly learn you can't support two managers, or you end up supporting one and not the other and it's a huge amount of jeopardy for that individual. So I would ask, have you been successful with this organizational arrangement in your current company?

MR. FINLEY: Yes. So as you say, the manager of engineering is a direct report to the site vice president in our organization, solid line, essentially. That individual would be a dotted line to the vice president technical support in the corporate organization.

Any time you have a dotted line and a solid line you have to obviously manage priorities. So it's essentially a matrixed organization that takes good communication and a good setting of priorities, but yes, that's how the Constellation organization that I'm familiar with is set up.

MEMBER SKILLMAN: Okay, thank you.

MR. FINLEY: Other questions about organization? Okay, so we'll move to Section 13.2 which is Training. This begins on Slide 14.

MR. HUNTER: I just had one clarification for Dr. Schultz. In 13.1.2.2.1.4 where the site director for quality performance and improvement, it does say the corrective action program lies with him. In your clarification you want, are we going to maintain that as a matrix line item or as a direct report line item?

MEMBER SCHULTZ: That's my question.

MR. HUNTER: Okay, I wanted to make sure.

MEMBER SCHULTZ: In most plant organizations it's important to have a direct line to plant management in order to fully implement a quality improvement program including a corrective action program. They seem to line up to me.

MR. FINLEY: Okay, so we'll keep that action --

MR. HUNTER: Yes, I just wanted to make sure I answered --

MEMBER SCHULTZ: Yes, thank you. Thank you, Mark.

MR. HUNTER: Just to clarify that I'm correct on what I said.

MR. FINLEY: Okay, and Slide 15 talks about the COL information item related to training programs, and there's not a lot of detail here. It's mostly an incorporate by reference section with respect to what's in the U.S. EPR FSAR.

However, we will follow NEI guidance as you see here, the Template for Industry Training programs, and that includes Appendix Alpha which is the Cold License Training Plan. And there's a chart with respect to the plan on the next slide, Slide 16. It shows essentially the development of the staff and the development of the training program would actually begin six years prior to a commercial operation, so that's T-6 up at the top where you would begin hiring and training your training staff, and follow that beginning at five years prior to commercial operation with the hiring of operators. And it goes on to show the first operator license class and through to the third operating license class, and that all finishes prior to loading fuel onsite. And then a similar waterfall, if you will, for the non-licensed operator training and as well the technical support staff training.

So system engineers, for example, onsite, these are the individuals that would be accepting the system during the turnover process. So this comes back, Dr. Powers, to your question about system turnover.

MEMBER STETKAR: Mark, before you leave this, I was going to raise it later but I think it's easier to do here. Back when you started talking about procedure development and in particular emergency operating procedures, there's a commitment that says emergency operating procedures shall be submitted to the -- I'm sorry. "The procedure generation package for the emergency operating procedures shall be submitted to the NRC at least three months prior to the plan date to begin formal operator training on the EOPs."

It also says, "Operating procedures shall be developed at least six months prior to fuel load to allow sufficient time for plant staff familiarization and to allow NRC staff adequate time to review procedures."

There's also a human factors engineering requirement that the procedures and human systems interface and training are all integrated so that we make sure that the procedures don't direct people to do six things simultaneously with 12 arms.

How is all of that integrated into this timeline? Because a procedure generation package three months prior to the plan date to begin formal operator training on the EOPs -- that's to the NRC I understand -- and development of the procedures six months prior to fuel load, according to this timeline says I'm doing a bunch of remedial training for licensed operators on emergency operating procedures in the last six months before I load fuel, which doesn't strike me at being very good about training those operators and giving them the knowledge base, in particular the background documentation for the EOPs that kind of walk you through accidents and why they're laid out at that way, or completion of the human factors engineering which would seem to be necessary before I really start training the first group of my licensed operators.

MEMBER SCHULTZ: It's a little different in your presentation, Mark, on 26.

MR. FINLEY: Yes, so we haven't gotten to the procedures section yet, but I understand that development of the procedures has to be well integrated with the training, hiring and training plan which is your point. Maybe it would be best to -- Wayne, could you --

MR. MASSIE: Okay, I'm looking at 26.

MR. FINLEY: Yes, if you could put Slide 26. Hopefully this speaks to --

MEMBER STETKAR: That helps. That last bullet on 26 does. But that's what I was expecting. But that's a bullet on a slide for a presentation to an ACRS subcommittee. It's not something that's written in words in the FSAR.

MR. FINLEY: Right. So I think as the bullet says, our goal would be to have procedures available to be trained on, and of course if the procedure is available that means it has to go through the process of HFE, HSI as you say, and all the other writers' guide requirements with respect to writing procedures.

However, I would imagine that there will be some procedures that aren't ready for that first training class such that there will be new procedures written later that we are going to have to come back and do training on. The procedures that must be written up of course are the procedures that operators qualified on at the end of that first operating class.

So the plan has to be detailed and we have to know which procedures are needed when, and they have to follow the process that we commit to with respect to the Reg Guide here that you see and the requirements for HFE, et cetera.

So I don't have a slide presenting the detailed procedure development plan. I can tell you that we have one and it is integrated with the training plan, but there will be some procedures that are not required for that first operator who's qualified that will come later that will have to be backfit in the training program.

MEMBER STETKAR: Yes, and in terms of detailed system operating procedures and some alarm response procedures perhaps, I can understand that.

Emergency operating procedures are a little bit different because they require much more integration into not only the plant design itself, but also especially for senior reactor operators who are supposed to be orchestrating the response to an actual event. The knowledge base behind the EOPs and why they're laid out the way they are is an important part of training of those personnel.

MR. FINLEY: That's exactly right. The emergency operating procedures would have to be completed prior to the start of training because they're so fundamental in the plant design as well as the operator training.

MEMBER STETKAR: Sorry to get you out of sync here, but my question sort of fell better in terms of that timeline that you laid out because of the long lead time as you've shown on Slide 16 for the start of that, the first operator training class, so you can get two or three of operators, you know, well trained and qualified by the time you actually load fuel.

MR. FINLEY: You're quite right. The procedure development plan would be a significant part of the preparation of the operation of the plant, and we could show a block similar to what you see for the training program here just for procedures.

MEMBER STETKAR: The last bullet on this slide alleviates, on the one that's up there now, 26, alleviates many of my concerns, but I didn't quite see that anywhere in writing.

(Simultaneous speaking.)

MR. HUNTER: The way AREVA is set up right now is they have an operations group, an operations integration group. They are working on the B&W EOPs, AOPs for the EPR. So by the time long before we ever get a first operator the simulator should be done.

We should have a basic set of procedures that has all of the major steps for normal emergencies and a severe accident management, it's called the OSSA, that should be done and completely developed. And we should have all that to give to our training staff, because we're going to have to train our training staff to train the operators.

So the training staff, we'll start working with them and start reviewing what they, we'll get the details down, the valve numbering, the lettering, that kind of stuff down. So all that should be done well before we get the first person like you and me that's going to get his license.

MEMBER STETKAR: I hear that, and I agree they should.

MR. HUNTER: Well we're on the right path then, right?

MEMBER STETKAR: I also read words.

MR. HUNTER: Oh, I see. I don't have the right words written down, okay.

(Simultaneous speaking.)

MEMBER STETKAR: -- in, you know, the licensing document.

MR. FINLEY: Okay, maybe if we can come back to Slide 17. This comes back to the training section, 13.2. We do have a specific COL information item that relates to Fukushima Recommendation 7.1 in spent fuel pool instrumentation.

I won't read it to you here, but essentially we established a license condition to assure that we have the proper operator training for the use of the portable power supply that would be involved in order to use this spent fuel pool instrumentation to monitor a level in a Fukushima-like scenario where you didn't have any AC power. So specific to that requirement. And there's a timeline that we've committed to in terms of implementing that.

Okay, that was it for training. Unless there are questions we'll move to emergency planning. And on Slide 19, so we have a COL information item to provide a site-specific emergency plan. And we talked about that already.

We have done that in accordance with 10 CFR 50.47 and 10 CFR Appendix Echo. It is Part 5 of our COLA. We just provided Provision 8 to the emergency plan. That was April 30th, just recently. And that new revision of the emergency plan does incorporate the revised EP rule. It came out end of 2011, I think.

We have also addressed the staffing analysis to meet the guidance in NEI 10-05, and have incorporated requirements from the NUREG that you see there. So we follow the industry guidance with respect to the emergency plan.

CHAIR POWERS: Can you remind me, have you done evacuation time estimates?

MR. FINLEY: I'm sorry?

CHAIR POWERS: Have you done your evacuation plan estimates?

MR. FINLEY: Yes, we have.

MR. HUNTER: The evacuation time estimate, yes, a study was done. That's correct.

MR. FINLEY: Maybe Scott, do you want to summarize that?

MR. MCCAIN: Well, the new study was provided, I want to say in 2011 or 2010.

MR. FINLEY: We've done one specific to Unit 3 and it takes into account the existence of Unit

1 and Unit 2 as well.

MEMBER STETKAR: Are you going to update that? The evacuation time estimates on the emergency plan, as I understand it, are based on 2000 census data projected out to 2008, and then extended out from there. I'm just going to go out on a limb here and say it's not likely that the plant will be operating in the next three or four or five years. Is there a plan to update all of -- yes?

I'm certainly not --

(Simultaneous speaking.)

MEMBER STETKAR: I'll allow myself some uncertainty, you know, the old, so you say there's a chance? Are you planning to update the emergency plan with 2010 census data? I didn't have time to go back to the census reports for this area to show how the population dynamics have changed in, you know, the last 15 years. Some parts of the country have seen, you know, rather dramatic changes.

MR. FINLEY: I don't know specifically unless, Scott, do you know? Is there a requirement in the rules to update the --

MR. MCCAIN: Yes, there is. In the new rule you have to review it on an annual basis and determine if there is a certain margin of change and if that margin of change hasn't been met. Then you have to go back and do the reanalysis, and then a section going to put in the E-Plan for the new rules.

MEMBER STETKAR: Okay.

MR. HUNTER: The nice part about that, Doctor, is Calvert Cliffs 1 and 2 is currently using our evacuation time estimate, and as they update theirs, say we don't get to operating in five years, we can always follow along with that and keep track of how the population really is going, in their study.

MEMBER STETKAR: Okay, good. Let me make a note here.

CHAIR POWERS: Are the population dynamics in the vicinity one of a decreasing population?

MR. FINLEY: Mark, you can chime in. I would think in terms of the, I know there's growth in the county south of Calvert County which is where the naval air station is located in St. Mary's County, so there is some growth there. But generally, in the area of Calvert County where the site is located there's not a lot of growth.

MR. HUNTER: I wouldn't call it declining.

MR. FINLEY: It's not declining.

CHAIR POWERS: I mean what we've seen for a lot of the sites is at best static and, in fact, I think the Clinton site is actually --

MR. HUNTER: We have a lot of big farms and a lot of big farm owners up until a couple of years were selling their farms for great profits, and now they've stopped development of the bigger farms. So there are big tracts of land available. Even around the site there's, you know, 150 acres right next to the site that's for sale currently. The average guy couldn't afford that property.

MEMBER STETKAR: Well, there are a lot of non-average guys who tend to be mobile as they get older. So I looked at one site that had growth. The closest population center here had grown 35 percent in the last decade. I won't tell you where it is, but you might -

(Simultaneous speaking.)

CHAIR POWERS: I mean for the Clinton site, it was really interesting. The populations were all down and now it's substantial.

MEMBER STETKAR: One question I had, and again I've not seen the emergency plan so all of the information that I have is gleaned from the SER. There's apparently, and correct me if I'm wrong. There was a series of RAIs about evacuation of people in Zone 3, and again you'll have to forgive me because I don't have the actual plan to look at, in northbound and southbound directions on Routes 2 and 4.

And there's a statement that says, well, okay, we evacuate people northbound will actually bring them closer to the site, but don't worry that those will be okay. And I was curious whether that evacuation strategy is actually built into the plan. Because it strikes me, in a real event local authorities are going to be fairly reluctant to send people toward the plant, and people who might be given those instructions might be even more reluctant to go toward the plant. So I was wondering whether that strategy is part of the plan.

MR. MCCAIN: No.

MEMBER STETKAR: Okay.

MR. MCCAIN: What the plan from the utility side has is all of the technical reasons why you would evacuate or shelter a particular --

MEMBER STETKAR: Sure, okay.

MR. MCCAIN: -- either radiological or, you know, for the shelter point. That recommendation based on plant conditions then goes to the offsite agencies and they factor in all of the offsite considerations such as impediments if there happen to be any, ability to notify the public, and which routes they want to take and if they want to make the closer-in zones first and that would be the later zones afterwards. So our plan assigns on that, but the state plan goes into the details that you're looking at --

MEMBER STETKAR: Okay, because the reason I brought this up is, again it's from the SER, but it says in RAI the staff requested the COL applicant to clarify whether local authorities have agreed to evacuate people northbound and southbound.

In a December 18th, 2009 response to RAI 156, Question 13.03-33 A.2., the COL applicant stated that the draft ETE report was submitted to the counties and comments were received in February 2008. There were no adverse comments regarding the routing of evacuees. The implication being that you really explained this to the local people and they said, yes, that's fine. We'll send them north.

MR. MCCAIN: It's in how they implement that.

MR. FINLEY: I'll just make sure I understand, so it said north and south on 2-4?

MEMBER STETKAR: That's all I know. You know, I know where the road is, and presuming I could kind of guess where Zone 3 is.

MR. FINLEY: I would think what that means, and we'd have to check the wording, is 2-4 runs north-south adjacent to the plant, and those people that are south of the plant would continue south. Those people north of the plant would go north. I don't think you'd take the people south and run them by the plant.

MR. FINLEY: There was an impediment in the 2 and 4. I guess if the bridge is down or something south of the plant then --

MEMBER STETKAR: Again I'll give you, this is from the SER so I'm not reading from the report. It says, ETE Report Section 7, general population evacuation time estimates states that balancing the vehicle demand from Zone 3 in the northbound and southbound directions on Route 2-4 results in a significant decrease in the ETE as demonstrated in the sensitivity study of the ETE Report Appendix I, Evacuation Sensitivity Studies. Although this routing moves some of the evacuees closer to CCNPP, the risk of exposure is minimized.

MR. FINLEY: Okay.

MEMBER STETKAR: So that sounds like you're sending people from southwest of the plant, north, to minimize traffic on the road.

MR. FINLEY: Right.

MEMBER STETKAR: I understand at a high level you don't get into that detail, but I was curious if your ETE report takes credit for minimizing that congestion. In terms of your evacuation time estimates, you're essentially stating that the local authorities have agreed to move people in the direction of the plant. And I'm not quite sure that's really going to happen.

MR. FINLEY: Well, I agree with you. The words you read mean exactly what you're saying.

MEMBER STETKAR: But again, you'll have to excuse me because I don't have your reports. I'm only quoting out of the SER which may have paraphrased things. It just caught my attention.

MR. FINLEY: I would have to confirm, but from the words you read our ETE must take credit for --

MEMBER STETKAR: That's what I was going to say. The only reason I bring it up, not in terms of detailed planning, who's going to tell which people to turn left or right on the day of an accident, but if your ETE report actually takes credit for that in a sense --

MR. MCCAIN: So we'll confirm that. We believe it does. We can come back with the justification that's appropriate, but I don't think it does.

MEMBER STETKAR: Well, this says somebody did a dose assessment and they probably won't get very much, is my interpretation of the last part of the sentence that I quoted. But in the real world, in a real event, I am not at all convinced that people will be very happy to go toward the plant or even somewhere that looks like it might be toward the plant.

MR. FINLEY: Okay, so we'll take an action to confirm that --

MEMBER STETKAR: Thank you.

MR. FINLEY: -- and provide justification if it's correct.

MEMBER SKILLMAN: Let me ask this question. You're building this plant effectively adjacent to Calvert Cliffs 1 and 2. What changes in the emergency plan are required because of the power level and design difference of this plan versus Calvert 1 and 2?

MR. FINLEY: So I'll let the experts talk in a second. But essentially, Calvert Cliffs Unit 3 will be a single unit site, if you will. We don't intend, in general, to share resources with Calvert 1 and 2. However, the emergency plan does require some sharing of resources and some communication.

In terms of staffing, we wouldn't expect to use any Unit 3 people on Unit 1 and 2, or any Unit

1 and 2 people on Unit 3. There are some areas where we do share and we are, in fact, we have the recent RAI to provide a formal letter of agreement with Calvert 1 and 2 to confirm their support of elements of our emergency plan that are required. Things like, for example, the emergency operating facility.

And before we were to actually share the emergency operating facility, we would of course have to do a study that determines what kind of space we need and to make that space available, et cetera. So that hasn't yet happened.

MR. HUNTER: I don't think we answered Dr. Skillman's question. He wanted to know if the fact that the EPR has so much more total megawatts than the combined Unit 1 and 2, is that --

MEMBER SKILLMAN: It's a different design shape, that what you're doing is creating a multi-unit site and you have two units of one design and one of a different design, I would think you've got some fire brigade implications, you've got some infrastructure implications. Even though they're different units that you're going to be, because you're UNO you're going to be sharing resources.

MR. HUNTER: Well, it's two different companies. It would be like Nine Mile

Point/Fitzpatrick.

MR. FINLEY: Right, Calvert Cliffs 1 and 2 would not be part of the UNO organization. It's actually a different company. So the sharing is limited to certain facilities, and we'll have those facilities delineated in this letter of agreement.

In terms of staffing, no sharing of the operations, maintenance, emergency staff. Now obviously for the local emergency resources, fire department, first aid, et cetera, they will have to have specific training with respect to access to Unit 3 like they do now for Units 1 and 2. But in terms of the other support staff they would really only be responding to Unit 3, or 1 and 2, but not both.

MEMBER SKILLMAN: Okay, let me just pull this thread a little further. Is the community aware that you actually have two independent nuclear power plants within a mile or two of each other?

I ask because your local responders are critical to the success of your emergency plan. That's firefighting, police, fire police, volunteers and ambulance, medical personnel for nursing homes, that type of thing. So at least it's my experience in emergency planning, your best friend is the local community that really understands what you're up to because they will work with you if they trust you.

MR. FINLEY: Right.

MEMBER SKILLMAN: So to what extent are they aware that if this Unit 3 is to be built, you now may have some different fire pre-plans for your local fire fighting departments? You have different responses perhaps from the state police and from the local and county sheriffs or police departments.

So I'm curious if these are two independent units, how the community has been introduced to this idea, because in some cases the community probably responds to you.

MR. FINLEY: So let me answer the question a couple ways here. So first, we are required and we have received certificates, letters of agreement, from the different local first aid, fire, police authorities that acknowledge Unit 3 as a new unit, and they're capable to provide emergency support to that unit. There hasn't been a detailed training of these individuals, but they are aware there's a separate new nuclear unit being planned for Unit 3. So one piece.

Now in terms of the community, overall, are they aware of the, say the ownership structure being different for the two sites? I can't say that we've had any specific outreach to that effect, and I really can't comment to the level of knowledge that the community has with respect to that.

Mark, do you want to --

MR. HUNTER: No, I would agree. And you'd be surprised the number of people even in the community that don't know the plant's there, existing plant. Even though we've got a great big sign out on the highway, I have people from St. Mary's County, I tell them where I work, they like, where's that? Because they don't really know what's over there. But we have not done a comprehensive, and we won't until we start construction.

MEMBER SKILLMAN: When you declare a general emergency and you're in your 15-minute count to notify, how many different municipalities do you have to notify?

MR. HUNTER: You have Dorchester County which is across the bay. You have St. Mary's County which is across the river, and Calvert County which is just up the street.

MEMBER SKILLMAN: So it's three. Thank you.

MR. HUNTER: You're welcome.

MEMBER STETKAR: Let me follow up a little bit. There was a statement in the FSAR, and it kind of dovetailed on Dick's line of questioning. You know, I understand separate organizations and I understand separate interfaces with local emergency responders and things like that. That we have an event on Unit 3, we have an event on Unit 1 or Unit 2, and I think they probably tend to think of them in isolation that way also.

What happens when you have a site-wide event? For example, it says in the FSAR that CCNPP Unit 3 emergency plan will have a separate emergency response organization, fine. Emergency planning staff, fine. Training program, fine. Emergency action levels, not so sure about that. Because if I now have a hurricane hit the site and I have my emergency response organization for Units 1 and 2 say, oh my god, I'm declaring a site emergency, and my emergency response organization from Unit 3 is saying, no, no, no, everything is fine, what do my emergency responders now, at the local and state level, say is going on, especially if they sense that they're getting conflicting information from the two organizations about what's going on, you know, behind the razor wire?

MR. FINLEY: And I'll look to Scott if he wants to comment on the new EPR rule. I'm aware that Fukushima has specific recommendations in the area of multi-unit events, simultaneous multi-unit events at the same site. We have not implemented those recommendations at this point, but we will be required to through the process of --

(Simultaneous speaking.)

MR. FINLEY: Yes, I'm not sure which recommendation it refers to. I know --

MEMBER STETKAR: It sort of filters through there, and Steve might remember which one it is, but the notion focused through.

MR. FINLEY: Certainly in terms of communication, EALs, we would have to coordinate with Unit 1 and Unit 2 to develop a plan that's integrated for multi-unit events.

MR. HUNTER: And when we first started our project we had the emergency management people from the county in and laid out our emergency action level structure for general emergency sites and stuff. And so they've had, I would call it an overview that our structure is going to be very similar to CC 1 and 2.

When an event's declared at the site, since we use a common system of sirens and notification, the incident commander will come to the site and the incident commander would be briefed. The emergency personnel, the 60-minute responders you asked me about, they're in a separate building and they're all going to be, it's going to be one, two and three in the same general area.

MEMBER STETKAR: And I'm not so much concerned about them, because they're coming in, essentially you own them. They're coming in to help you. I'm more concerned about the, and I think Dick is, about the local emergency response, fire, police, local and state, you know, county and state, for example.

MR. HUNTER: When they send an incident commander to the site, not me, I don't own this person. He doesn't work for me. He works for the state and the county. When that incident commander comes to the site and he establishes his command post, he gets direct information from the control room saying this is the conditions that we have.

And security meets them and says, okay, this is what you have to do to go here or there, especially for, say, having a hostile action event. So that, in my opinion, alleviates the confusion about what are they going to do when they get to the site. Because they have an incident commander that's trained on all three units.

MEMBER STETKAR: I'm more concerned about people who are setting up roadblocks and starting to mobilize evacuations of hospitals and schools and things like that, getting the public mobile.

MR. HUNTER: That's controlled by the incident commander at the site though.

MEMBER STETKAR: Okay.

MR. HUNTER: It's a state response, not a Calvert 3 response to that.

CHAIR POWERS: Does seem to take care of his --

(Simultaneous speaking.)

MEMBER STETKAR: One of them and not two. One sitting in --

MR. HUNTER: I would think so.

MEMBER STETKAR: One sitting in Unit 2 and one sitting in Unit 3.

CHAIR POWERS: But they're all in one place.

MR. MCCAIN: I can clarify that just a little bit. That incident command post that they're setting up, there will be representatives sent from Unit 3 out there to liaison, and the same thing's coming from Unit 1 and 2. So they're dealing with one head and feeding information at each of the plants.

MEMBER STETKAR: Okay, thanks.

MEMBER SCHULTZ: I can see that there could be an opportunity to join together on the EOF facility to provide emergency response, but as you go through the elements that have been raised by the Fukushima event, you've got even more diversity among the plant types that you're dealing with here. I would not underestimate the staffing as well as the communication facility that you need to augment the EOF if you're going to do a combined approach.

MR. FINLEY: We agree with you, and we do believe there are modifications needed now to the EOF that's currently in place that supports Unit 1 and Unit 2. So we agree.

MEMBER SCHULTZ: Simply to assume that there is an event, it may be unimaginable, but there is an event that's going to affect all three units at the same time, and go with that as the way in which the facility is designed and operated would be a very good thing to do.

MR. FINLEY: Right, and I think that's --

MEMBER SCHULTZ: And I'm sure you'll be doing drills and exercises that are going to be requiring that.

MR. FINLEY: Agreed. And I think that's required by Fukushima Recommendation, I want to say it's 9 --

MEMBER SCHULTZ: 9.3.

MR. HUNTER: That does the staffing and communication, but I think 4.2 will force you into drills and that once we get to EOP 8 and its rule that it makes that'll further clarify that.

MEMBER SCHULTZ: Well, you have the opportunity, if you move in that direction, to provide an overall upgrade appropriately, and if you do it right then you'll accomplish a good thing for all three units.

MR. HUNTER: Yes. Dr. Skillman, did you have a question?

MEMBER SKILLMAN: No, I just would make the comment, I was involved in the site and took the site to its site area emergency on a Sunday morning. And until you've done it you really don't understand how the local responders respond, and once you do it there is a new sensitivity to how the police, the firefighters, but particularly to the volunteers who make up a large portion of the municipal responders, how they respond. It's worth trying one time.

And so often the drills are just a cookie-cutter drill, you kind of know what's coming. But if you ever get to a site, and heaven help you if you get to a general, you learn some lessons that are learnable only in that event on how these little pieces fit together. And the fabric is much more delicate than one might think it is.

MR. FINLEY: Agreed. Good comment. Okay, if we can come back to Slide -- I'm sorry?

MEMBER STETKAR: No, no. You almost made the 15 seconds. A quick plant level question, and you might not have the answer. TSC, technical Support Center. It's Unit 3, so I don't care about anything but Unit 3. It's a non-safety related facility.

The displays and things in the TSC as my understanding are non-safety related despite the fact that they provide post-accident monitoring and information. My recollection is the U.S. EPR on the non-safety side of the plant has a couple of different power supplies.

One is categorized as a 12-hour uninterruptable power supply which is something that's fed from, the batteries have the capacity for two hours to supply all the loads, and then the operators apparently have a set of predefined loads that they shed that extend the life of that supply out to 12 hours. And there's another power supply that is only rated for two hours.

Where's the Tech Support Center instrumentation and displays powered from? I couldn't find it anywhere.

MR. FINLEY: And I don't know the answer.

MEMBER STETKAR: We heard discussions about the availability of post-accident monitoring displays, instrumentation, you know, the guide information into the plant, technical support information into the plant. So I was curious where it comes from.

MR. FINLEY: Right. And I'd have to take an action to get back with --

MEMBER STETKAR: Yes, I thought you might. I just wanted to ask. I looked, honestly. I looked in Chapter 8. I couldn't find it as a load listed anywhere.

MR. FINLEY: Okay, so we'll take that action. With respect to communications, this Slide 20 talks about a little bit, there is a Tier 1 Fukushima Recommendation to assure that you have communication systems that are AC independent. Of course that doesn't get you --

(Simultaneous speaking.)

MR. FINLEY: -- data network, but with respect to communication there's this -- okay, so Slide 20. It does talk about the Tier 1 Recommendation 9.3, and this focuses on communications and staffing. It essentially requires a staffing analysis to be done and an evaluation of your communication capabilities to assure you're capable of handling a Fukushima-like event that involves an extended loss of all AC power at the site.

And essentially we have established license conditions to address this recommendation. We do some additional detail in terms of procedures to be written in order to do a detailed staffing analysis and revise the emergency plan as necessary. So we are committed to doing that at least two years prior to the initial fuel load.

I covered Slide 21 as well, so we can move on. That's it for emergency planning. Let me ask if there is other questions about emergency planning.

MEMBER SKILLMAN: Yes, we spoke early on about the delivery for the emergency procedures, and Mark mentioned that B&W is putting together what will be the first package for the trainers to train the first class. Where will the EALs be scribed and practiced? How early will the EALs come out?

MR. HUNTER: As far as how the EALs are done, right? I think AREVA has, what we need to finish that is the actual instrument numbers and names, so the general overall structure --

MR. MCCAIN: I think the EALs are in the

ITAAC but they're developed prior to, or along the same timeline as the procedures. The NEI template is out and the commitment is to develop the EALs under NEI 99-01 Rev 5 with the two deviations that have been just recently approved.

MEMBER SKILLMAN: Will the NRC review the EALs?

MR. MCCAIN: They have to be submitted and approved.

MEMBER SKILLMAN: Let me go a little bit further. So the EALs basically direct actions that end up starting emergency cooling equipment or ventilation equipment or that type of thing.

MR. MCCAIN: No, the EALs are only for classification to determine which four levels you fall in. The EOPs will be deciding how the plant is operated.

MEMBER SKILLMAN: Okay. Do the EALs point to the EOPs?

MR. MCCAIN: In terms of levels that you may declare upon, there may be a certain, like critical safety function status tree, if you meet certain criteria in the EOPs for critical safety function then you will declare, based on fission product barriers, you know, one of the four levels. So it feeds the EALs, if that's what you're asking.

MR. HUNTER: It's kind of backwards from the way you described it is that you're in an EOP, something happens. You go to the EAL and see where you're following an EAL and then you declare that EAL. You don't have an EAL and then go to an EOP to find out what to do.

MEMBER STETKAR: And you're right, the critical safety function status tree is kind of pointing in both directions in some sense.

MR. HUNTER: Does that answer your question?

MEMBER SKILLMAN: I'm well familiar with the process. I'm just probing here.

MR. HUNTER: Oh, okay. I'm sorry.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Just to carry on, so we do and it's in Table 13.4-1 of the FSAR which covers all operational programs and the timing of implementation of those programs. But there is a specific item that relates to implementation of the emergency plan which talks about the timing for full participation exercises, having detailed implementing procedures, et cetera.

And the milestones for that are varied, from two years to initial fuel load to 180 days prior to initial fuel load. So some of those milestones with respect to the details of the emergency plan, I think, would pick up the procedures and the training that you're speaking to.

MEMBER SKILLMAN: Thank you. I'm good, thanks.

MR. FINLEY: Okay, so moving to Section 13.4. This relates to operational programs and we've identified the operational programs required to support operation at Unit 3. We essentially have a list of those programs.

I spoke to that just a moment ago that 13.4-1 lists all of the programs and our commitment in terms of milestones for implementing those programs. We don't have detailed programs written or implementing procedures written for these programs at this point in time, but we have an obligation and a commitment to do that.

The programs are listed on Slide 24. Again, I don't have the details in this table, but the details of the timing and the scope of implementation of each of these programs is captured in Table 13.4-1. Is there any questions on operational programs?

MEMBER SKILLMAN: This is a good place for me to reintroduce my question about that poor engineering manager having two reportings. My experience has been you'll take a look at this chart and give an EQ to your engineering guy and maybe your pre-service testing and so on.

And so here is this individual who's reporting to corporate and also to the site VP, may have a group of system engineers and component engineers perhaps and design engineers. And operations is saying, hey, I need this, and corporate is saying, hey, I need that.

So here is this individual that's really pulled in two directions. What I've seen is the program engineers reporting to the site engineering manager get pulled in both directions, and what finally happens is the program engineer says I can't do everything for everybody so I'm not doing anything. And the program dies.

Motor operating valves, solenoid valves, air operated valves, EQ, maintenance role, you name it, and what happens is you see under your maintenance role your red systems and your yellow systems begin to increase because people said, I just can't do everything for everybody, would you just please tell me what's important? And nobody can because these engineers are pulled in two directions simultaneously.

And so I just wonder how, this early out, this far out in your vision of how you're going to staff and build this unit, you can ensure that you get the programs with the fidelity and thoroughness that you really want.

And you get the right engineering resources reporting to the right level in the corporation and at the site to protect the site. Because at the end of the day, what you really want is pumps, valves, heating exchangers and instrumentation in programs that really protect the core, the clad and the containment.

So I'm always intrigued when I learn how widely stretched engineering becomes. But there's also a perception in your training of your operators, there's always this focus on having so many licenses. But it turns out many of those licenses are supported by a system engineer or a component engineer or design engineer.

And very often industry says that's a disposable resource, I can get that from a contractor. And those that have gone to get those from contractors have normally failed. So kind of ask again, you've got this site engineering person in two directions. You've got this list of operational programs. Most of these are regulatory required. You can't not do these. You're obligated to do these. So what's your vision to really make sure you get to where you want to get to?

MR. FINLEY: Okay, so I'll start and Mark can chime in. So it's not an easy question to answer. It is a challenge, but our vision is that this manager of engineering who would be responsible for most of these programs is reporting to the site vice president.

Okay, so his solid line reporting relationship is to the site not to corporate. So that would lean that individual towards supporting the site priorities. What we see is the corporate, the VP of technical support provided is the administrative program, if you will, for each of these to keep it standard, right. We want to have a standard program amongst the fleet of EPRs.

That VP of technical support would be responsible for providing that program, but the resources to implement that program would be at the site and under the direct control of the site VP. So we think it's the right mix of standardization and site dedication, site priority. But I don't disagree with you that they're going to have some corporate responsibilities that would pull them away, but they are under the reporting relationship of the site VP.

MEMBER SKILLMAN: This is really yours to match. This is a business issue, but it's a very important one because it's very easy for these engineers to become expendable, because you can always go and get another engineer but you can't go and get another life.

MR. FINLEY: Right, and that's a true statement.

MEMBER SKILLMAN: It may be that the most quiet, most reticent engineer who wears a double pocket protector and isn't the best communicator in the world is one of your most important quiet employees.

MR. FINLEY: Right.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay.

MEMBER SCHULTZ: I guess it's a caution, you know, Mark, that your last statement that well, at some point the engineering manager might be pulled away by corporate. Not pulled away physically, but just have to divert his attention from site to corporate in order to provide something to corporate. And that to me would be bothersome to see anyone that has a site responsibility to have to really look and focus on what corporate was now expecting. So that just, to me, suggests a caution in terms of setting up this organization to continuously understand that, as you have said, the corporate organization is to provide the umbrella in the future to a variety of sites.

And I think that can be a great assistance to the sites but, in fact, that's what the corporate organization is doing is providing guidance and support to the sites --

MR. FINLEY: That's right.

MEMBER SCHULTZ: -- in the overall operation and the sites are, in fact, the ones that are doing the operations and need their full attention directed at that. So the dotted lines make me nervous but --

MR. FINLEY: Understand.

MEMBER SCHULTZ: -- I understand it can work because I've worked in that type of organization before on both sides.

MR. FINLEY: So fair enough, it's an appropriate caution. You know, in general, the staffing for engineers, for operators, for the maintenance, is on a site-by-site basis. So there will be dedicated system engineers. There will be dedicated program engineers.

Most of your resources are dedicated to the sites, where the resources that we would have back in corporate again would be more, their function would be to maintain the program from an administrative standpoint to facilitate those resources at the site.

Not such there's a pool of engineers in corporate or a pool of operators at corporate that you would, you know, be swapping individuals around, that's not the normal mode of operation.

MEMBER SCHULTZ: That's what I was hoping to hear. Thank you.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay, that brings us to Section 13.5 which is Plant Procedures. We looked at this briefly, but just to summarize again. We do have a COL information item to provide site specific information for procedures.

The bulk of this information is incorporate by reference because there is a description in the U.S. EPR FSAR and we follow that. But we do supplement that with the bullets that you see here. We will follow Reg Guide 1.33 in terms of preparation of the site procedures. There will be a detailed writer's guide prepared, and that's the first step.

We have a writer's guide now but we'll augment that for different types of procedures. We have a quality assurance program description document now, and of course that touches on how you manage your procedural program. Each department head would be responsible for his or her procedures and preparation of the procedures.

And then procedures will be developed, as we talked about before, ahead of the project milestones so that you can train on those procedures prior to needing to implement them.

Slide 27, continuing plant procedures. This focuses on the operations procedures, and Mark actually alluded to this a little bit. We will do this, and again this is consistent with what's in the U.S. EPR FSAR, consistent with NUREG-0800 and the Babcock & Wilcox Technical Basis Document that will be system based, versed in emergency procedures, and we will follow the pressurized water reactor owner's group writers guide format.

And as Mark said before, the operating strategies for severe accidents methodology will also be followed, and that's a document that's referenced in the U.S. EPR FSAR.

Any comments or questions on plant procedures?

MEMBER STETKAR: Mark, is AREVA working with any of the owner's groups on the OSSA? That's another post-Fukushima fallout is this --

MR. HUNTER: Mike Bonfiglio from AREVA is the head of the operations support function, and he is on the B&W owner's group. He's actually the procedure chair for that group.

MEMBER STETKAR: Okay, good. Because, you know, there's three bullets under there, and the integration of those things as I understand it, in post-Fukushima there was, I think that's where the owner's groups are taking a lead there.

MR. HUNTER: We're going to get rules from the staff that says what has to be done.

MEMBER STETKAR: Okay, thanks.

MR. FINLEY: Okay, good. So that leaves us with Section, we're going to skip over as we said before Section 13.6, Security, and move to 13.7 which is Fitness For Duty on Slide 29. And I'm going to ask Doug Schweers to take us through the slide we have on Slide 30.

MR. SCHWEERS: Fitness for duty program that we have kicks off with a fitness for duty program during construction. It's regulated as Part 26 for supervision of personnel overseeing the construction site. They will fall under Part 26 and be under a full fitness for duty program.

Fitness for duty during construction kicks off as soon as the first SSCs go under construction. And as you know, once the initial hole is dug and the engineered soil is going to be put in place that's an SSC, so that we'll go into that, that program will start at that time for the workers.

And any workers that are associated with any safety related or security related SSCs will fall under that program and be required at random testing during the construction cycle. And this is consistent with NEI 06-06 guidelines.

And that program will mature into a full fitness for duty program as the site finishes construction and goes into meeting and testing cycles which would include the ITAACs, development of the security force and oversight by testing personnel. So that will become a full fitness for duty program.

That program will be managed as I said, from the beginning the full fitness for duty program will be available to the supervisors and management personnel from the beginning of the construction and on until the end, and then it will fall as the operating fitness for duty program.

MR. FINLEY: Questions on fitness for duty? Okay, then I think that brings us to the end of the presentation. So Slide 34, just to summarize, we have no contentions for Chapter 13. We have no departures or exemptions. There are 12 COL information items that we've discussed today.

The staff will discuss six current open items in their SER. We've responded to each of those open items. They're still under evaluation. And there is one confirmatory item that's been identified that we haven't yet incorporated into revision of the COLA.

That will be done in Revision 10 of the COLA. I think that's the updated emergency plan which was submitted April 30th. It's just not incorporated in the COLA formally but we'll do that. And we have no open RAIs at this time that we have not responded to.

Okay, and with that, that closes our presentation but we're available for other questions.

CHAIR POWERS: Do the members have any additional questions they'd like to pose on this matter?

MEMBER SKILLMAN: I do not. Thank you, sir.

MEMBER SCHULTZ: I have just a quick one. The Employee Concerns program, where does that fall under during construction?

MR. FINLEY: I don't know, Doug. So at this point in time, our Employee Concerns program falls under our legal organization. But I can't say that we've thought through where that falls during plant construction. So I would have to take an action to come back to you on that.

MEMBER SKILLMAN: I appreciate that. Thank you.

CHAIR POWERS: Okay, what I propose we do now is we take a 15-minute break to 25 of the hour, and we'll move to the staff.

(Whereupon, the foregoing matter went off the record at 3:17 p.m., and went back on the record at 3:32 p.m.)

CHAIR POWERS: Let's get back into session.

MR. ARORA: With us is Mike Miernicki. He's Chapter 13 project manager and he's going to lead the staff presentation.

MR. MIERNICKI: Thanks, Surinder. Good afternoon, everyone. Okay, I'm going to give you a brief overview of the Chapter 13 review by the staff in a few slides here, and then we'll move on to a technical presentation in one of the areas, emergency planning.

Okay, the staff review team for Chapter 13 consists of reviewers in the Office of New Reactor, Operator Licensing and Human Performance area. And then from the Office of Nuclear Security and Incident Response in several branches. The New Reactor Licensing Branch, the Reactor Security Licensing

Branch, Security Program Support, and Cyber Security and Integrated Response Branches.

Okay, an overview of the review shows the number of RAI questions that we asked in the various sections of the SRP and the FSAR application. You can see we had 178 questions, and the current status, there are six open items in the SER and they're all in the emergency planning section.

And with me here today I have Dan Barss, the team leader for the New Reactor Licensing Branch, and he's going to go through the EP review and include a discussion of those six open items.

CHAIR POWERS: Let me ask you just, there was a lot of discussion over the last hour and a half on the organizational structure of the applicant. And that seems somewhat outside the purview of what the NRC would look for. They would look for the function and not necessarily the organization, but it does list a question so obviously you paid attention to that. What do you think of this organizational structure?

MR. MIERNICKI: Me, personally, let me turn that to --

(Simultaneous speaking.)

MR. MIERNICKI: To be honest, in a previous life I did work with PG&E and Constellation Energy.

So I can offer some opinions having worked in matrix organizations before. I mean you ask very good questions about how the relationship between the solid lines and the dotted lines and those interfaces, and a number of questions about what happens if there's a conflict.

And what I was taught in the organizations that I worked in, we had a facilitated leadership instruction where when you came across it's the lowest level of the organization escalated those until you got the resolution up both chains of command.

And you didn't want to escalate those things too high because then the vice president is saying, why didn't you leaders at the lower levels solve those problems and why are you asking me to solve this problem?

You know, you know the priorities, you established the priorities by the leadership in both teams or both sides of the dotted lines. And that's my experience. And the answer for, it would apply to the answers to several questions. That's a personal opinion.

CHAIR POWERS: I mean one of the things I keep noticing in interacting is that NRC seems to be able to operate a matrix organization very well as reflected by this review. I mean it is a matrix review and they seem to be able to do it very well. Maybe at your view, resolve it now or somebody will resolve it for you and you may not like that resolution. Interesting. Well -- please.

MEMBER STETKAR: Since you brought it up I'll follow up a little bit. In the, virtually, the SER that we received to review there are a lot of, most of the sections refer to Rev 8 of the COL FSAR. In Section 13.1 though, in particular about organization, it's out of date.

MR. MIERNICKI: It was still at Rev 7, right.

MEMBER STETKAR: Well, I don't even think it was Rev 7, because I looked at Rev 7 and they had UNE and UNO. It refers to tables that didn't even exist in Rev 7.

MR. MIERNICKI: Okay. I wasn't aware of that because we tuned it up to Rev 7. That was the baseline when I talked to all the reviewers. Some people pushed it to 8, but 7 was the baseline. So it should reflect what was in 7.

MEMBER STETKAR: You know, I didn't see it. There were references to Tables 13.1-201 and 202, which are kind of generic organizational tables, and at least my version of 7 of the FSAR, I don't think I found them in there.

MR. MIERNICKI: And you saw that in 13.1?

MEMBER STETKAR: Yes, 13.1 seemed to have been the only section of the SER that was out of sync. I wouldn't have mentioned it except Dana mentioned it.

MR. MIERNICKI: Well, I'll take that back to the reviewer there and we'll make sure, you know --

(Simultaneous speaking.)

MR. MIERNICKI: Yes, eventually we're going to catch up to it, but I'll point that out.

MEMBER STETKAR: Only because the organization was so different.

CHAIR POWERS: I simply try to facilitate your reviews, I guess --

MEMBER STETKAR: Thank you, and I appreciate that.

CHAIR POWERS: My function as chairman, to facilitate.

MEMBER STETKAR: One of many functions.

MR. MIERNICKI: Okay, now we can move on to, the technical topic of interest is the emergency planning area, and I just introduced Dan Barss. Dan?

MR. BARSS: Thank you. As he said, Dan Barss, and regardless of what the sign says I do work for NSIR, although 90 percent of the work I do is for

NRO, so I guess --

(Simultaneous speaking.)

MR. BARSS: This review has been going on for a while and we have had some turnover in our staff. In fact, the initial reviewer is retired and gone from our organization. We've had a couple of other change in hands, and as the team leader of that group and having been here all the time I get the good privilege of addressing you folks, so hopefully we'll be able to answer your questions.

CHAIR POWERS: We're a wonderful group to talk to.

MR. BARSS: You are. I enjoy coming to these. Items of interest for this application, two items we thought to bring to your attention. One is as I'm sure you know, this is the reference COLA for the EPR design. And that really doesn't mean a lot in the EP area because most of EP is site-specific material.

There are a few things like the TSC and the OSC, which they designate to where they will be able to look at, but that's not to say that some other choice of building those plants somewhere else could move those facilities somewhere else if they wanted to. But for this one they have used the facilities and the designs as stated in the design specification. Another point of interest is that this is actually the first and only, that I know of to this point, co-located licensee for a COL. And there's one other site, or two sites, I guess, that fit into that co-located term and it was mentioned earlier, the Nine Mile Point/Fitzpatrick are co-located licensees.

When this application was originally submitted it was not a co-located licensee. It was all under Constellation's. But since then there have been change in ownership and different things, so they are now in that co-located licensee realm. And there are certain specific things that they need to address in that area. Those are items that we, the staff, have not fully looked at yet because that change has kind of been migrating.

And we did ask them in a meeting we had in January of this year, we discussed in a public meeting with them some of those things and we asked them to update some things that were in their application. And as they've mentioned, they provided that information to us very recently.

We have not yet reviewed that information, but it has been provided and we will be looking at those items. If you're interested and just to overview, some of the co-located things that we look at is things like the biannual exercise.

When you have two owners at a site or close together our regulations require that each licensee at each site conduct an exercise every two years. And we also require the offsite's participating in those exercises.

Well, that would result in, in this case, the state of Maryland having to do an exercise, you know, every year, and that was more than the burden we wanted the state to have. So that part of the regulation, which we cite on the slide there, basically allows the licensee or requires the licensee to do their exercises biannually, but it allows the state to participate with one of them every two years. So it's really a four-year cycle when each of the owners would be participating with the state and meets the regulatory requirements that are there now. There's more detail on that I could give you if you need, but I don't think we need to cover it.

As far as what we evaluated is, I think most of you know, we look at the application against the requirements or 10 CFR 50.47 and Appendix E of Part 50, and the applicable implementing guidance that generally speaking it's NUREG-0654/FEMA-REP-1 is the baseline document we use for that.

We have identified six open items, and on my next slide I'll talk about them specifically. The Fukushima Near-Term Task Force Recommendation 9.3, they provided us a response to that. That is still also under our review.

And the applicant, as they stated, recently submitted as the end of last month, their revision to the application addressing the EP rule changes that were implemented in November of 2011. They were required to address that and they have. We have not yet addressed those either.

I would like to address two questions which I heard, or comments that we discussed in the earlier hours. One is talking about the EOF and an exercise and the staffing in there. There is a specific ITAAC that the licensee has put in place, and if they hadn't we would have required it. That it requires them to do an exercise that basically brings both of those operating units into the EOF and run a drill that show that they can do this with, you know, both units or both operators and owners having a major catastrophe at the same time.

So that is a specific ITAAC and a specific requirement that we expect of them and that they will have to demonstrate that capability at some point in time.

The other item I wanted to mention that was talked about a lot was the EALs and the review of those EALs. And what I want to get clear and make sure that you understand that the review and approval of the EALs is done now before we issue the COL.

The staff will do no review or approval of the EALs after the issuance of the COL, and that's a very particular point that the lawyers would make sure that I made is that we cannot do any review work after we issue this license. All's we can do is confirm that they've done what they've committed to do in that.

And to that regard, what we have done with the EAL specifically, because there's a technical difficulty there that we don't know the pressures and the temperatures and the set points until you calibrate some things like that you can't put those actual numbers in there.

So what we have done is we've created, or NEI has created guidance documents or NEI 99-01. Now they're up to Rev 6. Recently, although the application that we ultimately review is written to Rev 5, I understand they've updated or are updating to part of Rev 6 in the latest submittal they've made to us.

But that document lays out specifically

what those EALs should look like, how they are supposed to read. And they have to give us that information without deviations, or if they have deviations they have to explain those deviations now before we finish our review work and accomplish it. And then the only thing that is done later is when they do submit those EALs we look at them to confirm that they have done what they said they would do. So there's a confirmation done later but there is not a review and approval done later.

MEMBER SKILLMAN: Let's pull that chart a little bit.

MR. BARSS: Sure.

MEMBER SKILLMAN: So the EAL is really a classification document?

MR. BARSS: Yes.

MEMBER SKILLMAN: That lets the on-shift team determine whether it's a UE, an alert site or a general?

MR. BARSS: Correct.

MEMBER SKILLMAN: Getting to those levels are driven basically by fission product release.

MR. BARSS: Among other things, yes.

MEMBER SKILLMAN: But that's what pushes particularly the general --

MR. BARSS: Right.

MEMBER SKILLMAN: -- which is where the greatest concern would be for evacuation, a keyhole or whatever shelter, you know, whatever it might be.

How can the EAL be created this soon not knowing what some of the fine details will be for the locality, the population, the environment, the meteorology, and the fission product inventory?

MR. BARSS: What I think you're talking about there is what is the dose protection offsite or --

MEMBER SKILLMAN: What you said is, ACRS, please be mindful of the fact that the EALs are going to be approved now.

MR. BARSS: Right.

MEMBER SKILLMAN: And my experience is that the EALs are fairly customized for the site, for the event, and by site I mean not only the facility but the location of the facility, particularly with respect to the population zones. So for design certification how can you do the EALs? I mean it would have to be custom for this site.

MR. BARSS: Yes, and what we expect them to do is, we expect them to take the NEI document, and I have to address each of the EALs that are identified in that. It's a very extensive listing of all the things that they need to have EALs for, what the basis for that EAL is, how they will find that information, what monitors they will look at to get it. That's all provided in that base document.

And then they take that base document and site-specificize it or, you know, make it specific to their site and provide the monitor numbers, the valve numbers, the switch gear numbers, whatever, are put in.

But some of the things like, what's the bay level, well, they haven't finished building so maybe it's going to change a foot or two or something, so they can leave, you know, declare the event, if the bay rises above 17 feet, well, you don't know if it's going to be 17, 17.5, 16.5, so you can say the bay level rises above blank. They have to fill in that blank later. That's what we expect them to fill in.

They don't have to determine, you know, that they need a level for that, that's already done in advance. It's just the specific number that we allow for them to fill in later and that's where we're confirming that they've filled in that number and provided that level of information.

MEMBER SKILLMAN: Does the ITAAC push that?

MR. BARSS: The ITAAC, I believe the way

their ITAAC is written is that they will provide that at a certain period of time, and I think it says six months before they load fuel. I'm looking to them to see if that's correct.

MEMBER SKILLMAN: Now I understand, thank you.

MR. BARSS: And important in our discussion earlier was although the ITAAC allows them to provide the EALs to us for confirmation six months before they load fuel, as we discussed in the training discussion, they need to be training the operators on these things long before that. So these EALs need to be developed long before that.

But as we also know, as you go through training and you work through the EALs, you're going to find things that the operators say, wait a minute. We could do this better this way or we could do it better that way, and there may be some adjustments to that. So we allow a window there and we allow them to pick the time when they're going to provide them to us.

MEMBER SKILLMAN: Well, you've got the operators, but you also have the EDs and your ESPs who have to have that same level of knowledge, that also the basic understanding of what all of that means because they actually end up driving the emergency.

MR. BARSS: Right.

MEMBER SKILLMAN: Okay.

MR. BARSS: Let's go to the next slide, and we will talk about EALs on this next slide also. These are the open items that we have. I won't go back to the slide, but originally they said there were 58 questions which we asked in the EP area. That depends on who's the bean counter.

We said there were more than 268 questions that we asked, but it just depends on how you log them into the system. We had lots of questions, but we're down to these six items that we still are looking for resolution on.

The first one there, inconsistent discussion of the impediments to developing emergency plans. What we found in the evacuation time estimate which was mentioned earlier, they do make some statements about the unusual characteristics of the roads in the area. Narrow pavement, sharp curves, things like that that could impact egress, or ingress and egress from the site.

And then later in their application they don't specifically say whether or not this poses any specific impediments of the development of the emergency plan. Well, the staff found that kind of a contradictory statement that wasn't clarified. And so we asked them to resolve that what appears to be a conflict internal to the application, where at one point they're saying that there are these unusual circumstances of the road systems, yet they didn't address it in their ETE and didn't say that these things didn't impact it or whatever. So we want them to clarify that in their application.

Stop me if you want to discuss any of these in detail. I'll just keep going. The next one is the shift staff's ability to provide the EP functions and the major tasks. And this one, you raised a very good question about that. This is an open item to the staff, and I'll say a significant open item to the staff at this point.

Again, we haven't reviewed what they've recently submitted that hopefully answers this question, but in the staff's review of the information we previously saw it wasn't clear to us how those on-shift functions and major tasks that have to be done were going to be accomplished by the staff that was there without these 30-minute responders.

They were eliminating those 30-minute responders, and that's an acceptable thing to do as long as you can show us how those functions are going to covered and carried adequately until the time that the augmented staff starts arriving. And in our review of the application at this point they have not yet satisfied our review of that.

MEMBER STETKAR: But the major focus of this is the 30- versus 60-minute response time, not necessarily individual responsibilities for on-shift personnel, at least as I read the open item.

MR. SCHWEERS: Yes, it's more functions and --

MEMBER STETKAR: So most of the discussion is about the 30, you know, how can you justify 30 --

MR. SCHWEERS: Well, it's not so much justifying not having, the problem or the concern we have is, we have certain functions and capabilities that we want and need to have covered. And if you've got enough people on shift to do that then that's okay, but if you don't have enough people on shift to do that we expect --

MEMBER STETKAR: As I understand it, part of this ongoing discussion was the commitment to make sure that they have 24/7 coverage of the maintenance personnel at least in I&C, you know, as we discussed earlier, electrical and mechanical.

MR. SCHWEERS: Okay, the next one, the

emergency action levels, and it's still an open item. Specifically, there are some design specific deviations from this NEI 99-01 document that we talked about. Each of the designs may not, you know, align up exactly with that so they need to explain to us what those deviations were.

Their recent submittal, again we haven't reviewed that, but in the previous submittal basically they just made a statement they were designed to specific deviations that we'll take. Well, that's kind of an open ended thing and we can't approve that. We need to know what those specific things are and how they're going to be addressed.

So we're looking forward to reviewing the information they have provided to make sure that they've answered each of those design specific deviations, because as I said, we can't review after we've gone and issued a license, we're done. So we need to have those answers now and then have them clearly understood.

Next, the notification system. There were some, I'll call it ambiguities in the application where it talked about the use of tone alert radios, reverse 9/11, and vehicles with PA systems. And it wasn't clear to us whether they were dependent upon them or not dependent upon them, whether they were using fixed sirens only, whether they were using these, so we've asked them to clarify that.

The next one is the central location for sample collection and analysis. Again it wasn't clear to the staff where that specifically was and whether it was going to be used for just the onsite samples or the onsite and offsite samples, and it just wasn't clear to us through our review of the application as how it was laid out.

And the last item is the dose assessment model in there. In the last response we saw from them they said that they would consider the site-specific characteristics in the model. We weren't happy with that, in that it needs to reflect the site-specific not just consider them was our response to them.

So we're looking forward again to reviewing their response to that RAI which we have not yet done. And that covers the presentation. We're open to your questions.

MR. MIERNICKI: Any questions on 13.3?

MEMBER STETKAR: I had one, and we, ACRS, do not normally address security related things, and I'll try to stay away from security. But we do address integration of things throughout the licensing process.

In the SER in Section 13.6.4.1.7, there's a rather lengthy discussion about the identification of target sets for the security assessment, security plan. And in that discussion there are many, many, like two manys may be too many. There are several references to the use of the PRA to inform that process. In other words, the PRA was used to identify what critical locations in the facility, and not getting into details, the equipment, you know, and so forth would need physical protection of a security screening.

During our review of the PRA we noted that the PRA that has been developed for the design certification and has essentially been incorporated by reference with the COL, except it's enhanced to include plant-specific features such as the ultimate heat sink design and so forth.

But that PRA requires quite a bit of work, let's say, in terms of breadth and level of detail to bring it up to what would be considered a technically acceptable PRA for the purposes of licensing applications and so forth.

The responses that we've received is yes, we're aware of, you know, the applicant is aware of that. Those upgrades will be made post-COL before the time of fuel load according to the process that's laid out in the regulations. That by the time of fuel load there must be a PRA in place that meets the requirements of guidance in, approved standards in place one year before the time of fuel load. Anyway those are administrative requirements.

My question is, is that ITAAC, because this would be an ITAAC not a staff review, is there an ITAAC that requires the security folks to go back and revisit that risk information input to the security plan with the fully upgraded PRA that's in place prior to fuel load? Follow my reasoning?

MR. MIERNICKI: Right, right.

MEMBER STETKAR: If you're using something that's simplified and needs enhancement as a basis for your security plan, and that thing, the PRA, is later upgraded and enhanced to make it more compatible with technical requirements in terms of breadth and depth, shouldn't there be something that --

MR. MIERNICKI: We had Pete Lee who was the 13, the security reviewer here earlier, and he just left. So that leaves me.

But another thought on the matter, I mean, I guess one way to slice it would be with ITAAC, but the other way to slice it as this plant's, as the PRA is updated, I was wondering would that cause the target set information to be updated? And that way, well, all this, I'm just pondering that, and therefore if feedback into 13.6, the information would be updated and then we would look at it again. That's another route versus an ITAAC route, and I'm not sure which way it would work.

MEMBER STETKAR: I don't know either, because we don't normally get involved with details of, you know, the security plans or updates to the security plans or information that's used as input to the security plans. I have no idea how that works. It's just that the --

(Simultaneous speaking.)

MEMBER STETKAR: -- extensive reference to the PRA, which I think is a good idea.

MR. MIERNICKI: Yes, I mean I'm wondering if it's part of UniStar's process. Does the PRA update cause you to go back and look at target size?

MEMBER STETKAR: I don't know.

MR. MIERNICKI: I'll take it back to the reviewer and we'll see if --

MEMBER STETKAR: I didn't want to ask UniStar because I didn't read any of the security level stuff. It came out primarily in the SER.

MR. MIERNICKI: Yes, I was just wondering what they had for a process question to update, how our target set's updated --

MEMBER STETKAR: I don't know.

MR. MIERNICKI: -- by PRA. And I'll try to find an answer to that.

MEMBER STETKAR: Thank you.

MR. MIERNICKI: Okay, before we throw it open to all questions, I think we had, Mark Lintz had an answer to one of the questions from earlier that was posed for UniStar.

MR. LINTZ: On 13.1. This is Mark Lintz. I did the reviews for 13.2 and 13.5, and I'm speaking for a colleague on 13.1. I came prepared to address a lot of things. I regret to say that apparently I am unable to address the footnote in the table.

So am in aware in general terms, as I said, about his review and his methodology, and while I cannot speak to the footnote in question in his writeup, at the break I went upstairs and obtained the writeup of our evaluation. In his writeup he made statements that addressed the situation in general. So it could be that the footnote either was addressed or may be a little bit of hyperbole, I don't know. But in any case, I can read some of these statements out of the evaluation.

MEMBER STETKAR: Just to make sure we're clear for the record, you're talking about the footnote

--

MR. LINTZ: On that 13.1.1 table that you referred to.

MEMBER STETKAR: Yes, thank you very much. Just so we're clear.

MR. LINTZ: In the evaluation, my colleague would address such things as minimum shift crew composition, and found that management in technical support and operating organizations as described are acceptable and meet the requirements, the regulatory requirements. Meet them as required for minimum staffing requirements for all nodes of operation.

So such statements like that appear in our evaluation and I simply cannot reconcile that footnote with these statements, but the fellow who did the review would certainly have considered the footnote and addressed it with the applicant and resolved it to his satisfaction.

MEMBER STETKAR: So the staff, if I hear what you're saying, recognizing that you're speaking for someone else and can indeed refuse to say anything --

MR. LINTZ: Correct.

MEMBER STETKAR: -- that the staff at least looked at that and feels comfortable with those words.

MR. LINTZ: Correct.

MEMBER STETKAR: In particular, the possibility that the STA position may be eliminated, which could leave me at least in my interpretation of those words with --

MR. LINTZ: I cannot, two and only two SROs in the control room. I cannot say with any certainty that he would look at it because I can only speak in general terms to the review. But knowing the individual and knowing his normal level of review, then I would certainly have expected him to have seen this footnote and to have addressed it, not in the review but to his own satisfaction.

MEMBER STETKAR: Okay.

MR. BARSS: Let me add a thought there in that. I do the 13.3 section, the Emergency Planning, and not that section, but there's a little bit of an overlap here in that in the emergency plan part of it. And one of the new requirements in the regulations that were updated in November 2011 is now the requirement for them to do the shift staffing analysis.

In that shift staffing analysis we require them to look at everybody that's on shift and determine whether or not they will be overloaded during an event, and if they've got enough people to cover everything that they're supposed to do. They have to walk through a number of different scenarios using their procedures and simulators, whatever they have, and identify whether or not all these functions can in fact be done or not.

And if they can't, then they need to adjust their staffing levels accordingly to address that. So that's one of the new requirements that the rulemaking did implement. It wouldn't look at the normal shift staffing and numbers, but it would look at the emergency planning response in that once you declared an event do you have the people that you need to cover all the functions that are required. That's an analysis that they will need to do in the future and apply to this.

MR. LINTZ: And to just take that statement and add to it, some of the words out of the 13.1 evaluations state that sufficient resources are available to satisfy the applicant's commitments for design, construction and operation.

So in a case like this where you have an emergency situation, you have to send one SRO out of the one control room, resources would be available. Now how that was determined, I don't know. But between the 13.3 review and the 13.1, apparently it was.

MEMBER STETKAR: Okay, well, I'll leave my question open. Because the way I interpret that table and the footnote in the table is I can have two and only two SROs in the control room, one of whom also wears a hat that has STA written on it, and one of whom must by definition be the emergency director.

Now if the emergency director wears the STA hat he can't fulfill the role of the STA and the emergency director simultaneously, in practice, because they are much different responsibilities. If he wears the, what I call shift supervisor SRO hat he can't wear the STA simultaneously because he's actively involved and cannot fulfill the intent of having an independent technical oversight function.

MR. BARSS: That's one of the reasons we now require that analysis.

MEMBER STETKAR: It sounds like from the emergency planning perspective it may be covered. But at least from that staffing perspective, from the normal shift staffing it's not clear. And that's exactly, when I read more of the concerns about the 30- versus 60-minute response time, it just sort of raised my level of concern about the complement of people on shift.

MR. BARSS: We share your concern. Thank you.

MR. MIERNICKI: Are there any other questions?

CHAIR POWERS: I think we can move on.

MR. MIERNICKI: Okay, great. In conclusion, except for the open items we listed above and discussed, the staff has concluded that the program areas in Chapter 13 are acceptable and in accordance with regulations. That concludes the presentation.

MR. ARORA: We have some action items. UniStar has taken a couple, three items that they need to come back into the committee, and we have one action item that we just got --

(Simultaneous speaking.)

MR. ARORA: -- proceed with that. And other than that, that concludes our presentation. Dr. Powers, I'd like to thank you for your time and the opportunity to present these.

CHAIR POWERS: It was very well done. I appreciated your presentation. It was very nice.

And that means we have completed our aspirations for this meeting and so we will not meet tomorrow. We will be interacting with you in a little more dynamic fashion over the coming months with looking to try to get so we can complete Phase 3 expeditiously.

MR. ARORA: That would be our wish also.

CHAIR POWERS: And I'm sure you're just as anxious as we are to get on to Phase 4. I think our planning and procedures committee would like to have a little more frequent updates, and so Kathy, you and I will coordinate and you can coordinate with Surinder and we can --

MS. WEAVER: And we'll get it on the schedule.

CHAIR POWERS: And we'll try to do some scheduling here as best we can. It's not to have any degradation of the quality of the review, which I have to say I am very, I continue to be impressed with the ability of the agency to carry out these matrix kinds of operations and so well and so thoroughly. And I think you guys deserve all the credit in the world for a high degree of professionalism in doing this.

MR. ARORA: Thank you.

CHAIR POWERS: And with that, I'm going to --

MEMBER SCHULTZ: One comment, Dana?

CHAIR POWERS: Yes, sir.

MEMBER SCHULTZ: I didn't have a chance this morning, Surinder, so I'll leave it with you. I wanted to comment on the presentation by Alice Stieve that the staff's investigation of the geologically young faults, the tour that they took of the site and also the investigation that was done in interacting with individuals who had done research and were providing information in general as well as to the staff regarding faults or potential faults at the site. I thought it was very thorough and even personal in terms of the investigation that the staff had performed.

MR. ARORA: Yes, a lot of efforts went into that.

MEMBER SCHULTZ: I appreciated that. It was very evident and I wanted to compliment the staff on that.

MR. ARORA: Thank you.

CHAIR POWERS: I have to echo that. I know that it is an extremely arcane field, and Dr. Stieve was able to present it in a transparent fashion. I was able to catch her after the meeting and note for her specifically that we very much appreciated that. And just what Steve says, that that tracking down of people that have written on it was just kind of a little icing on an excellent cake. So you have a great team, Surinder.

MR. ARORA: Thank you.

CHAIR POWERS: With that I'm going to adjourn us.

(Whereupon, the foregoing matter went off the record at 4:11 p.m.)

UniStar NUCLEAR ENERGY

UNISTAR NUCLEAR ENERGY

Presentation to ACRS
U.S. EPR^{TM} Subcommittee
Calvert Cliffs Nuclear Power Plant Unit 3
FSAR Chapter 2, Site Characteristics
May 8, 2013

Introduction

- RCOLA authored using ‘Incorporate by Reference’ (IBR) methodology.
- To simplify document presentation and review, only supplemental information, site-specific information, or Departures/exemptions from the U.S. EPR FSAR are contained in the COLA.
- AREVA U.S. EPR FSAR ACRS Meeting for Chapter 2 – Site Characteristics occurred on November 3, 2009.

Introduction

- Two Departures and two Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 2.5
- No ASLB Contentions
- Eleven (11) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 2.5.

Introduction

- Today Mark Finley, UniStar Senior Vice President, Regulatory Affairs & Engineering, will present the Calvert Cliffs Unit 3 FSAR Chapter 2.5.
- Today's presentation was prepared by UniStar and is supported by Bechtel, Rizzo Associates and AREVA.
  - Antonio Fernandez, UniStar – Structural/Seismic Engineering
  - Onur Tastan, Rizzo Associates – Structural/Seismic Engineering
  - Shankar Rao, Bechtel – Project Engineer
  - Todd Oswald, AREVA — U.S. EPR Technical Consultant Civil Structural
- The focus of today's presentation will be on site-specific information that supplements the U.S. EPR FSAR.

Chapter 2 Site Characteristics
Agenda

- 2.5 Geology, Seismology, and Geotechnical Engineering
- Conclusions

2.5 GEOLOGY, SEISMOLOGY, AND GEOTECHNICAL ENGINEERING

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL applicant will use site-specific information to investigate and provide data concerning geological, seismic, geophysical, and geotechnical information.

➢ Basic Geologic and Seismic Information

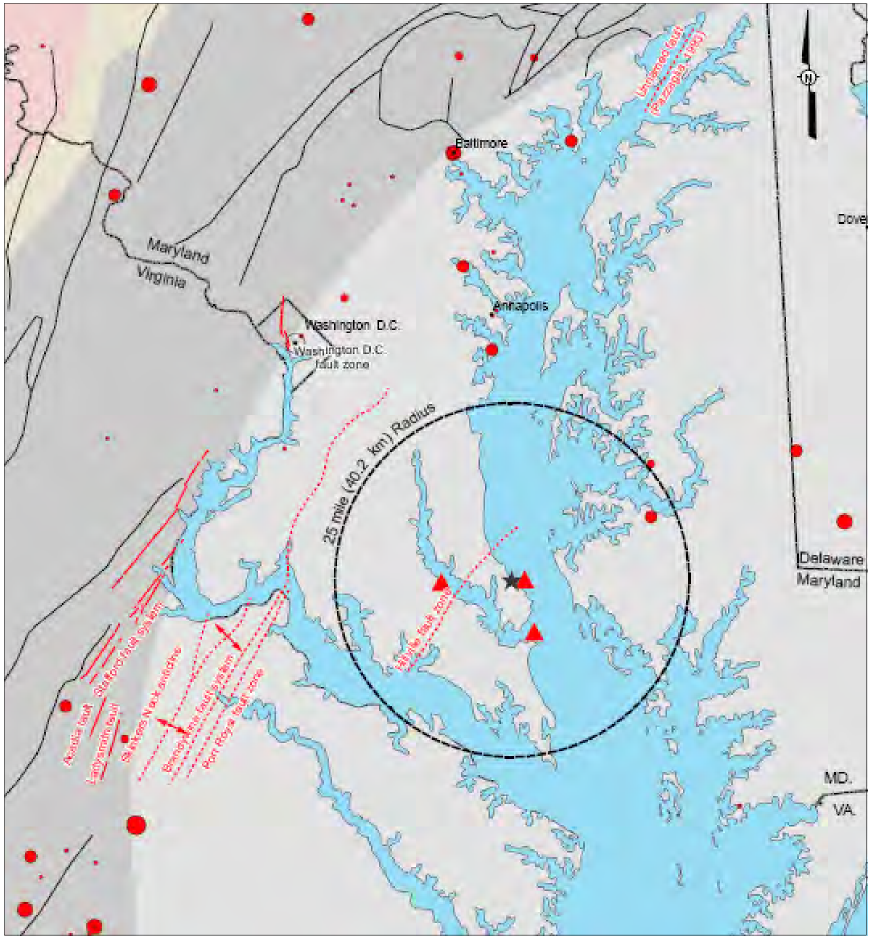
- The geological and seismological characteristics of the site region (200 mi radius), site vicinity (25 mi radius), site area (5 mi radius) and site (0.6 mi radius) are contained in Section 2.5.1 of the Calvert Cliffs Unit 3 FSAR.
  - ✓ Section 2.5.1.1 describes the geologic and tectonic characteristics of the site region
  - ✓ Section 2.5.1.2 describes the geologic and tectonic characteristics of the site vicinity, site area, and site

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Basic Geologic and Seismic Information (continued)
  - The geological and seismological information was developed in accordance with the following NRC guidance documents:
    - ✓ Regulatory Guide 1.70, Section 2.5.1, 'Basic Geologic and Seismic Information'
    - ✓ Regulatory Guide 1.206, Section 2.5.1, 'Basic Geologic and Seismic Information'
    - ✓ Regulatory Guide 1.208, 'A Performance Based Approach to Define the Site-Specific Earthquake Ground Motion'
  - Information is used to define the Safe Shutdown Earthquake (SSE) ground motion for the site and compare site-specific ground motion to the Certified Seismic Design Response Spectra (CSDRS) for the U.S. EPR.

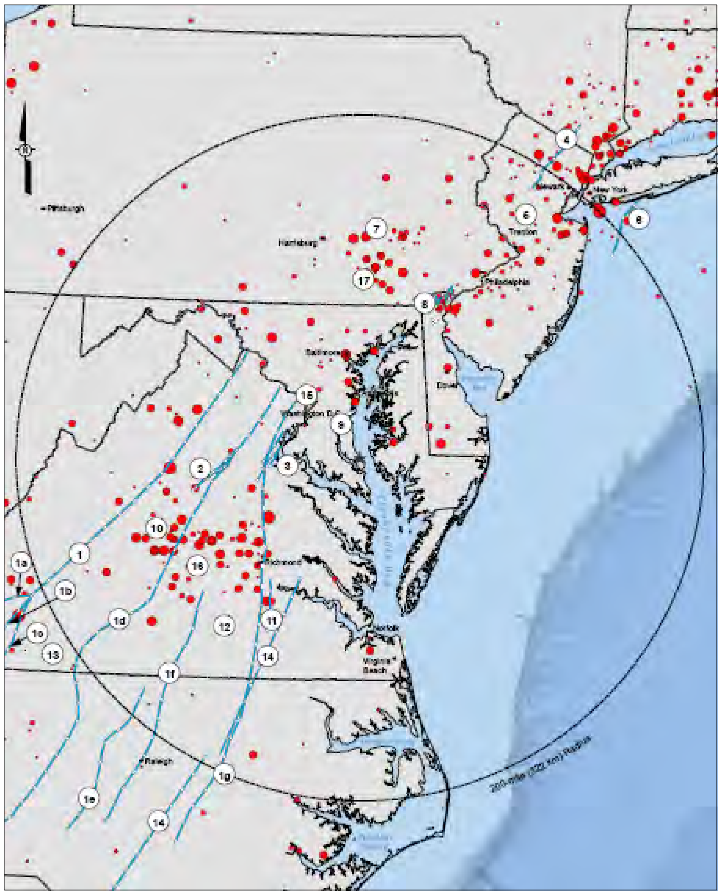
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Tertiary Age Tectonic Features



2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Possible Quaternary Age Tectonic Features



1. Fall Lines of Weems (1998)
2. Everona fault and Mountain Run fault Zone
3. Stafford Fault System
4. Ramapo Fault System
5. Kingston Fault
6. New York Bight Fault
7. Cacoosing Valley Earthquake
8. New Castle County Faults
9. Upper Marlboro Faults
10. Lebanon Church Fault
11. Hopewell Fault
12. Old Hickory Faults
13. Stanleytown-Villa Heights Faults
14. East Coast Fault System
15. Washington, D.C. fault zone (not classified)
16. Central Virginia Seismic Zone (Class A)
17. Lancaster Seismic Zone

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL applicant will review and investigate site-specific details of the seismic, geophysical, geological, and geotechnical information to determine the safe shutdown earthquake (SSE) ground motion for the site and compare site-specific ground motion to the Certified Seismic Design Response Spectra (CSDRS) for the U.S. EPR.

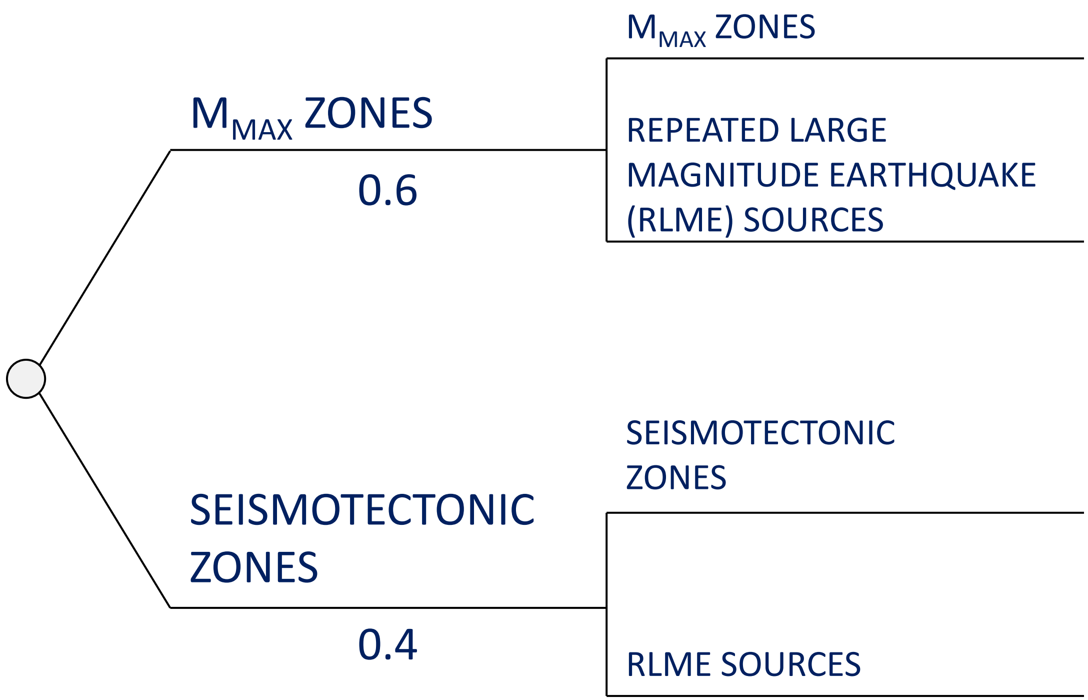
➢ Vibratory Ground Motion

- A detailed review of the vibratory ground motion assessment was carried out for the CCNPP Unit 3 site, resulting in the development of the CCNPP Unit 3 Ground Motion Response Spectra.
- As the first step in this process, a Probabilistic Seismic Hazard Assessment (PSHA) for a hard rock condition was performed taking into account guidance in NRC Regulatory Guide 1.208.
  - ✓ The recently developed seismic source characterization (SSC) for the Central and Eastern United States (CEUS SSC) (EPRI/DOE/NRC, 2012)
  - ✓ The EPRI (2004, 2006) ground motion characterization (GMC) model.

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

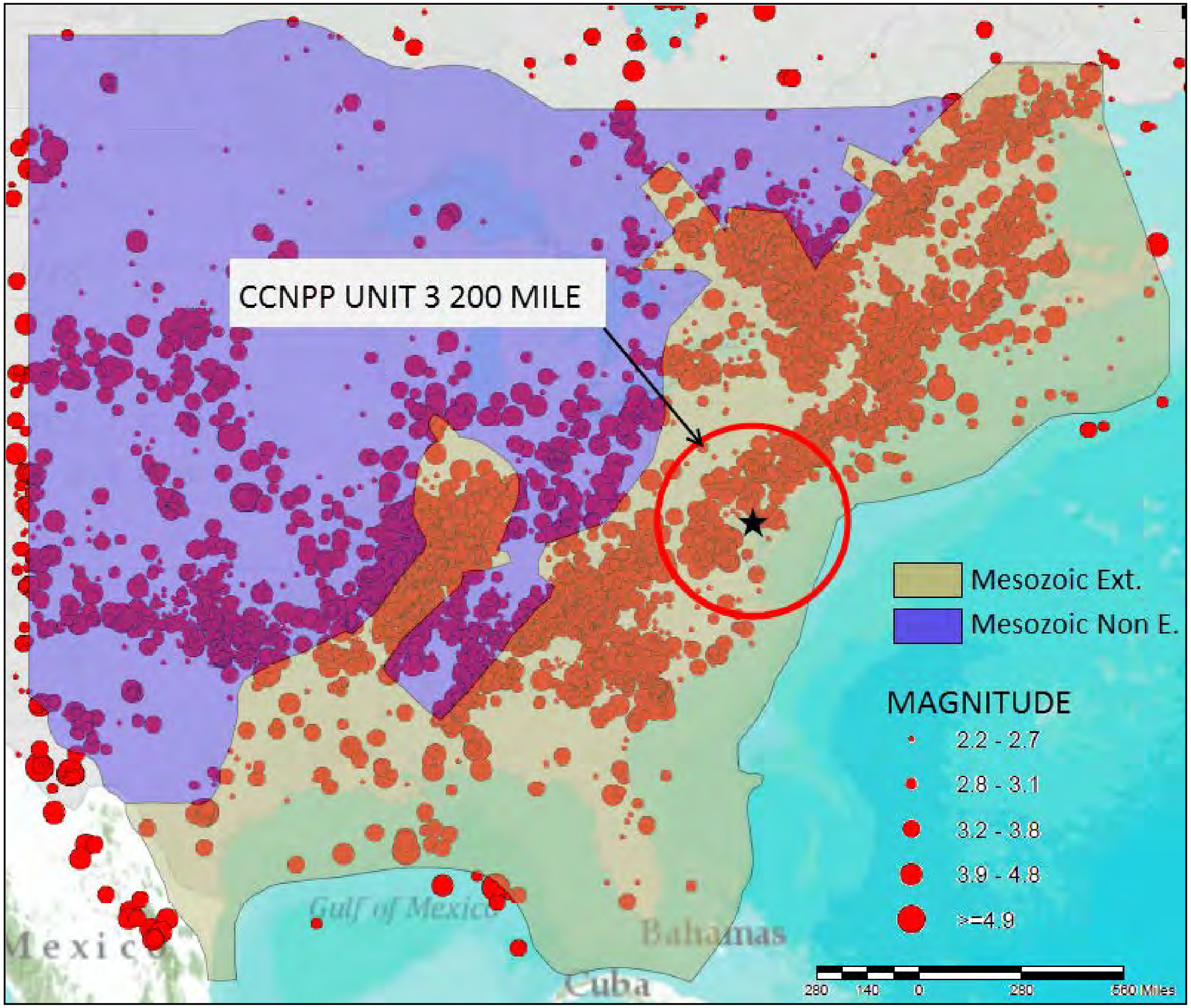
IMPLEMENTATION OF THE CEUS SSC – LOGIC TREE

CONCEPTUAL APPROACH	SOURCE GROUPS



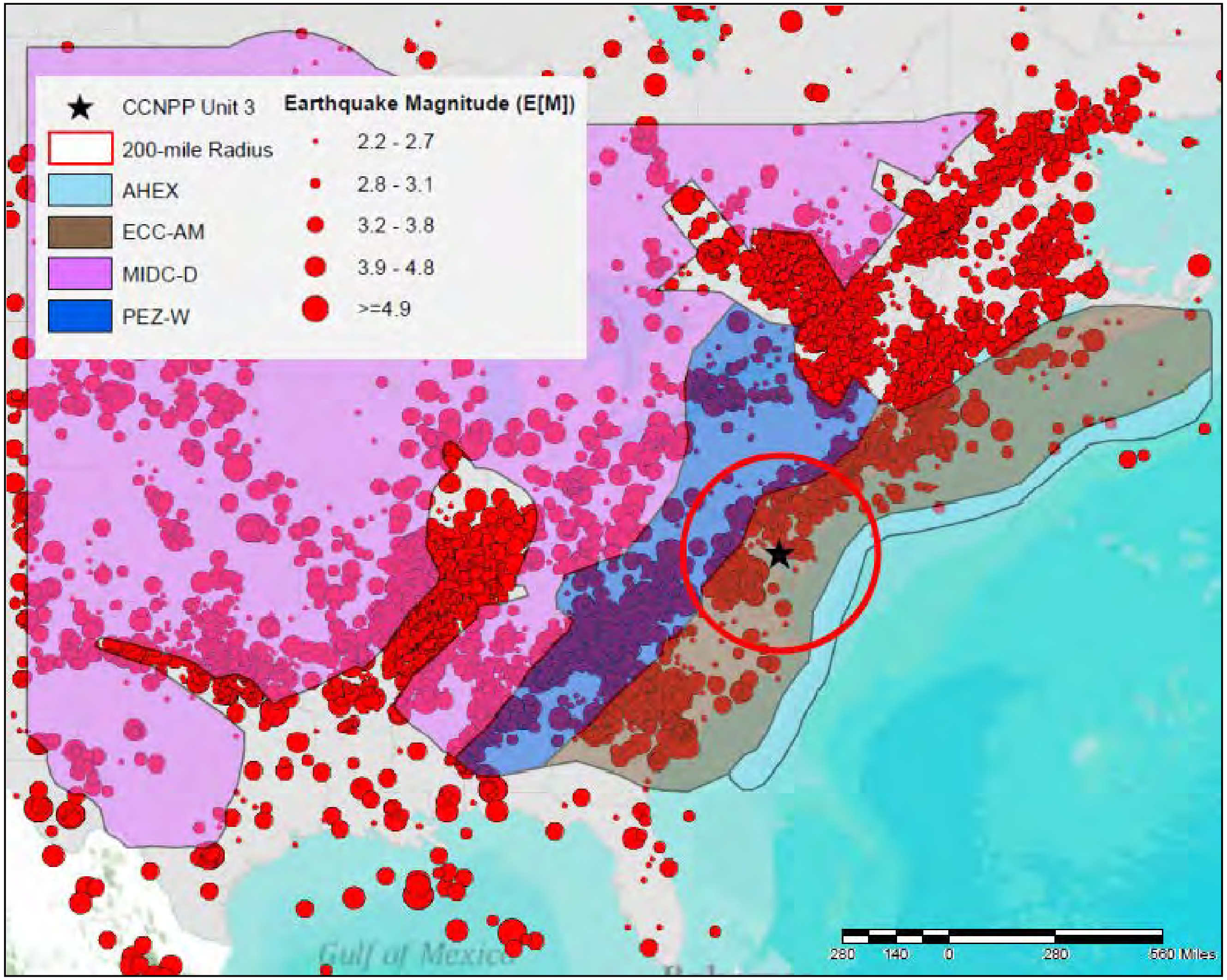
2.5 Geology, Seismology, and Geotechnical Engineering
COL Information Items

IMPLEMENTATION OF THE CEUS SSC – Mmax ZONES



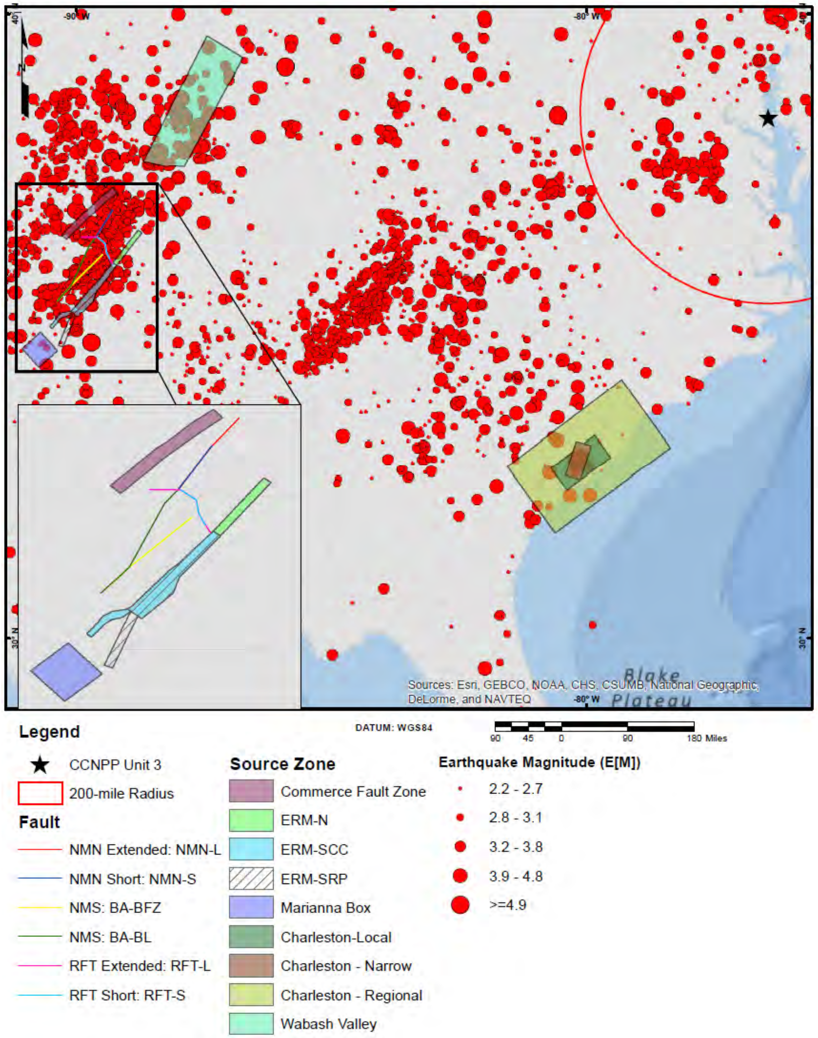
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

IMPLEMENTATION OF THE CEUS SSC – SEISMOTECTONIC ZONES



2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

IMPLEMENTATION OF THE CEUS SSC – RLME SOURCES



- Commerce Fault
- ERM-N; ERM SCC; ERM SRP
- Marianna Box
- Charleston (Local, Narrow, Regional)
- Wabash Valley
- NMSZ

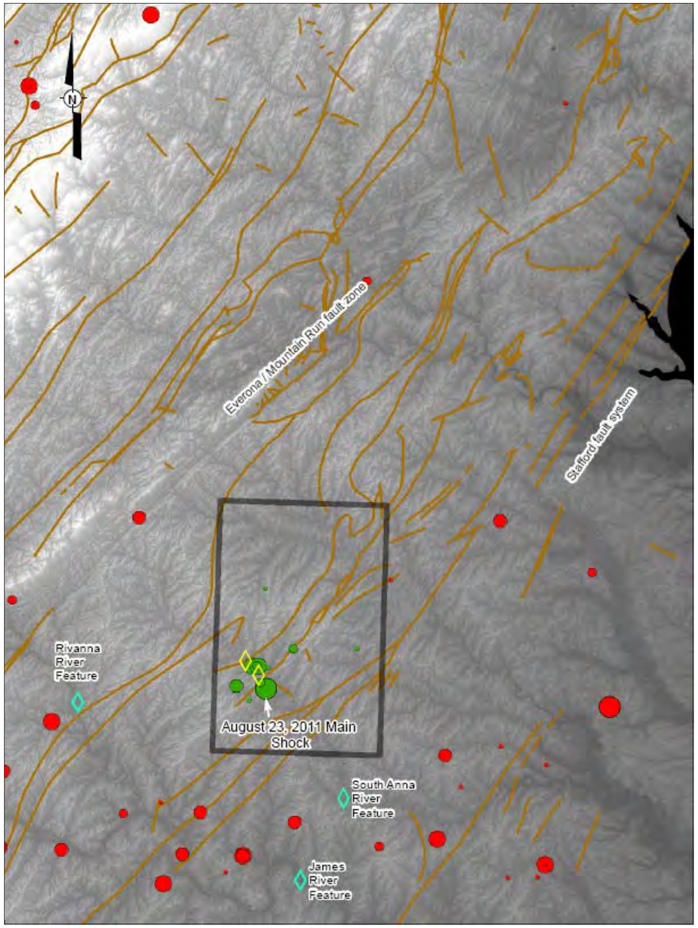
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

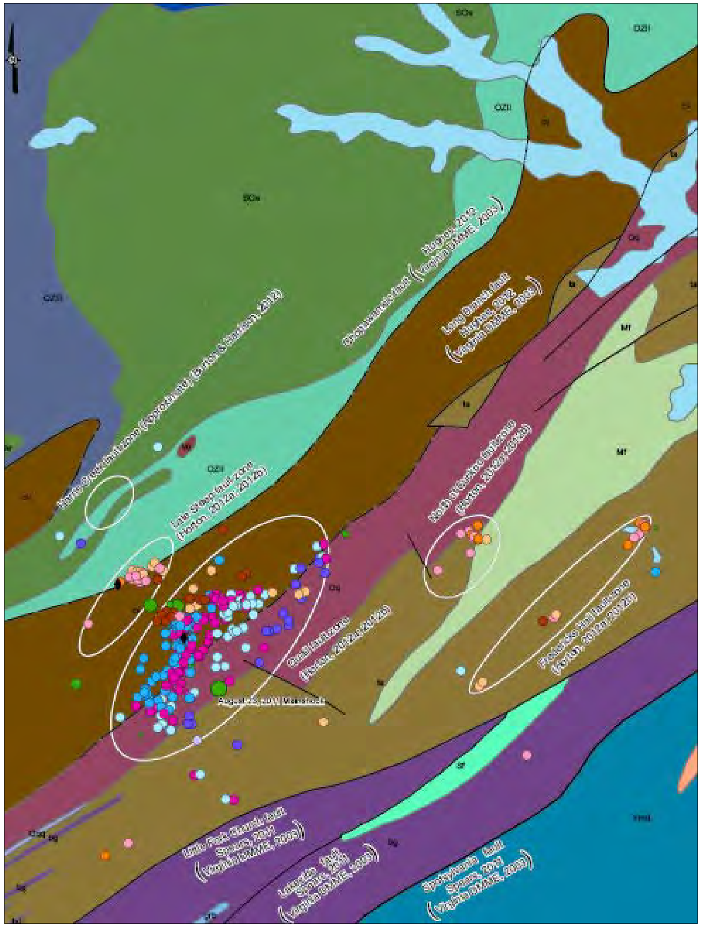
THE CEUS 2012 SSC AND THE MINERAL VIRGINIA EARTHQUAKE

- August 23, 2011, M 5.8 from the Central Virginia Seismic Zone (CVSZ)
- CEUS SSC catalog predates the Mineral Virginia Earthquake (MVE)
- MVE located in the CEUS 2012 Study Region source zone and the Mesozoic or Younger Extended Region (MESE) (EPRI/DOE/NRC, 2012)
- The magnitude of the MVE is less than the entire Mmax distribution considered in CEUS SSC
- CEUS 2012 SSC catalog adequately accounts for events such as the MVE

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Mineral Virginia Earthquake and Aftershocks (SER-Open Item RAI 385)





2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

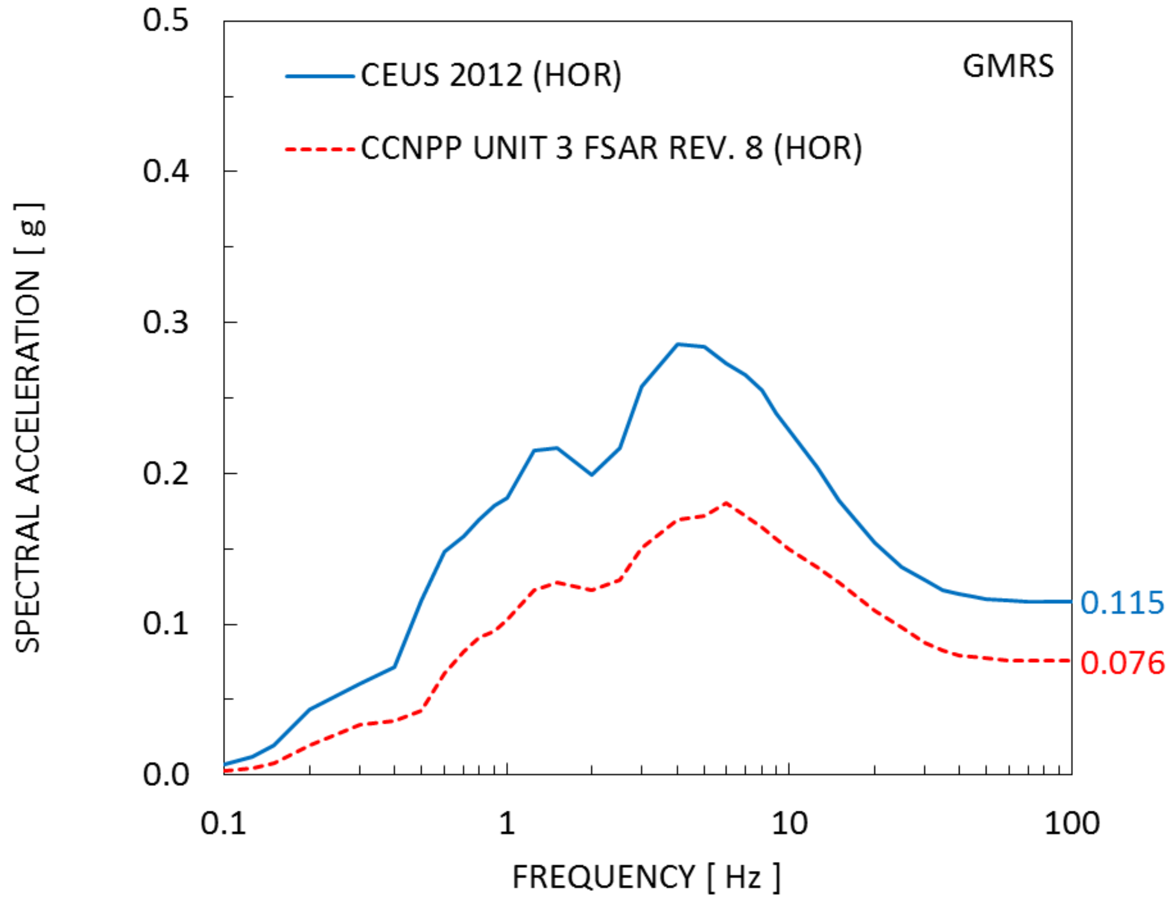
- Stafford Fault Systems (RAI 385 – SER-OI)
  - Some indication that movements along the Stafford fault system may be more recent, with small offsets (typically less than 3.3 ft (1 m) of Pliocene and Pleistocene terrace deposits
  - Small offset could be explained simply by the effects of differential subsidence and/or compaction
  - Topics of Interest
    - CEUS SSC seismicity associated with the fault
    - Geomorphic indications of activity
    - Stafford fault system

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Central Virginia Seismic Zone (RAI 385 – SER-OI)
  - Mineral, Virginia M 5.8 mainshock and the majority of associated aftershock hypocenters define a northeast-southwest trending tabular cluster centered roughly on Yanceyville, Virginia
  - A best-fit plane to this cluster (the so-named Quail fault zone) generally strikes north 30° east, and dips 45° southeast
  - Additional earthquake aftershock hypocenter clusters to the east and west of the Quail fault zone
  - Topics of Interest
    - Surface rupture or deformation of the ground surface in the vicinity of the up-dip projection of the hypocenter clusters, or elsewhere in the epicentral region
    - causal relationship between known fault systems or suspected fault systems and the August 23, 2011 mainshock event and aftershocks
    - Washington DC Faults

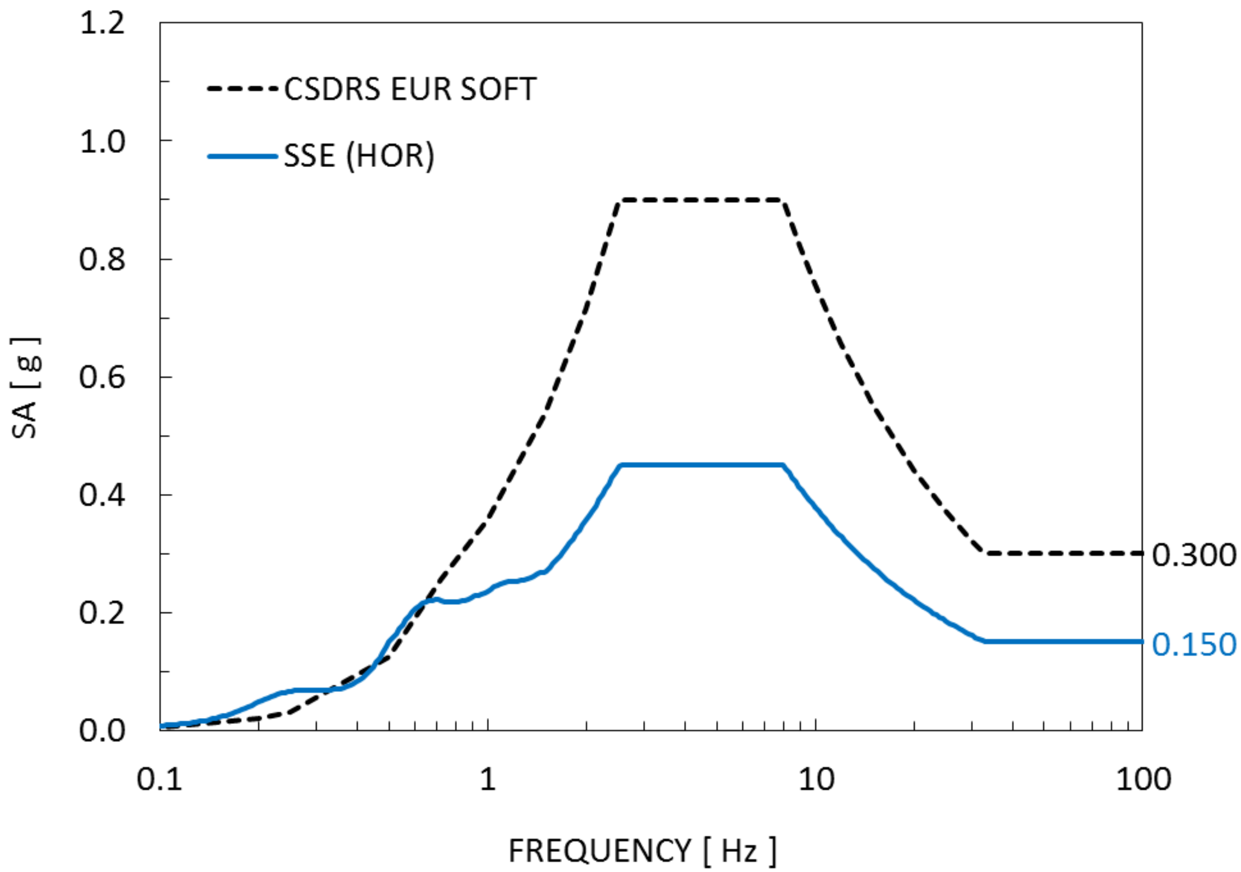
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

IMPACT OF 2012 CEUS SSC



2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

SSE and CSDRS



2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL will compare the final strain-dependent soil profile with the U.S. EPR design soil parameters and verify that the site-specific seismic response is enveloped by the CSDRS and the soil profiles discussed in U.S. EPR Sections 2.5.2, 2.5.4.7 and 3.7.1 and summarized in Table 3.7.1-6, Table 3.7.1-8 and Table 3.7.1-9.

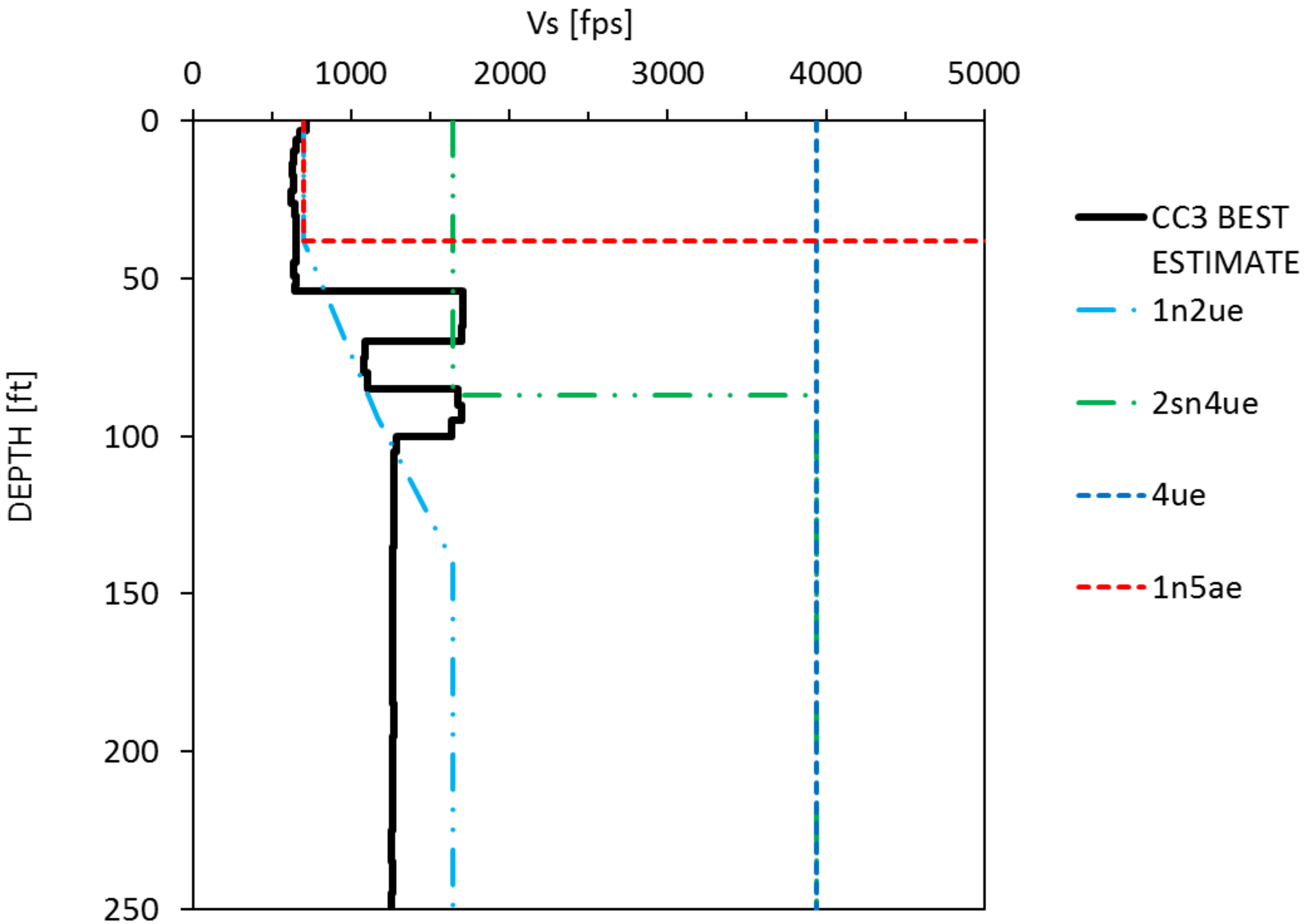
➢ Site-specific strain compatible soil profiles have been established for the Calvert Cliffs Unit 3 Site

  - Shear wave velocity
  - Damping

➢ Given the nature of the site specific shear wave velocity profile a full site specific soil structure interaction (SSI) analysis is performed to reconcile the seismic design of the Category I structures of the CCNPP Unit 3. The details of the SSI analysis are provided in Section 3.7

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

COL INFORMATION ITEM – 2.5.2, STRAIN-DEPENDANT PROFILE



2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL applicant will investigate site-specific surface and subsurface geologic, seismic, geophysical, and geotechnical aspects within 25 miles around the site and evaluate any impact to the design. The COL applicant will demonstrate that no capable faults exist at the site in accordance with the requirements of 10 CFR 100.23 and 10 CFR 50, Appendix S. If non-capable surface faulting is present under foundations for safety-related structures, the COL applicant will demonstrate that the faults have no significant impact on the structural integrity of safety-related structures, systems or components.

➢ Assessed surface faulting within a 25 mi (40 km) radius of the CCNPP Unit 3

- Review of existing geologic and seismologic data for the site vicinity
- Review of the EPRI/DOE/NRC (2012) SSC.
- Existing aerial photographs and satellite and LiDAR imagery for the site vicinity were reviewed for evidence of surface rupturing or related phenomena
- Additional ground- and aircraft-based field reconnaissance
- Discussions of the site area geology with researchers at the USGS, MGS, and various academic institutions

➢ Conclusion: there is no potential for tectonic fault rupture and there are no capable tectonic sources within a 25 mi radius of the CCNPP site

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL applicant will present site-specific information about the properties and stability of soils and rocks that may affect the nuclear power plant facilities, under both static and dynamic conditions including the vibratory ground motions associated with the CSDRS and the site-specific SSE.

➢ Geotechnical and geophysical site investigations

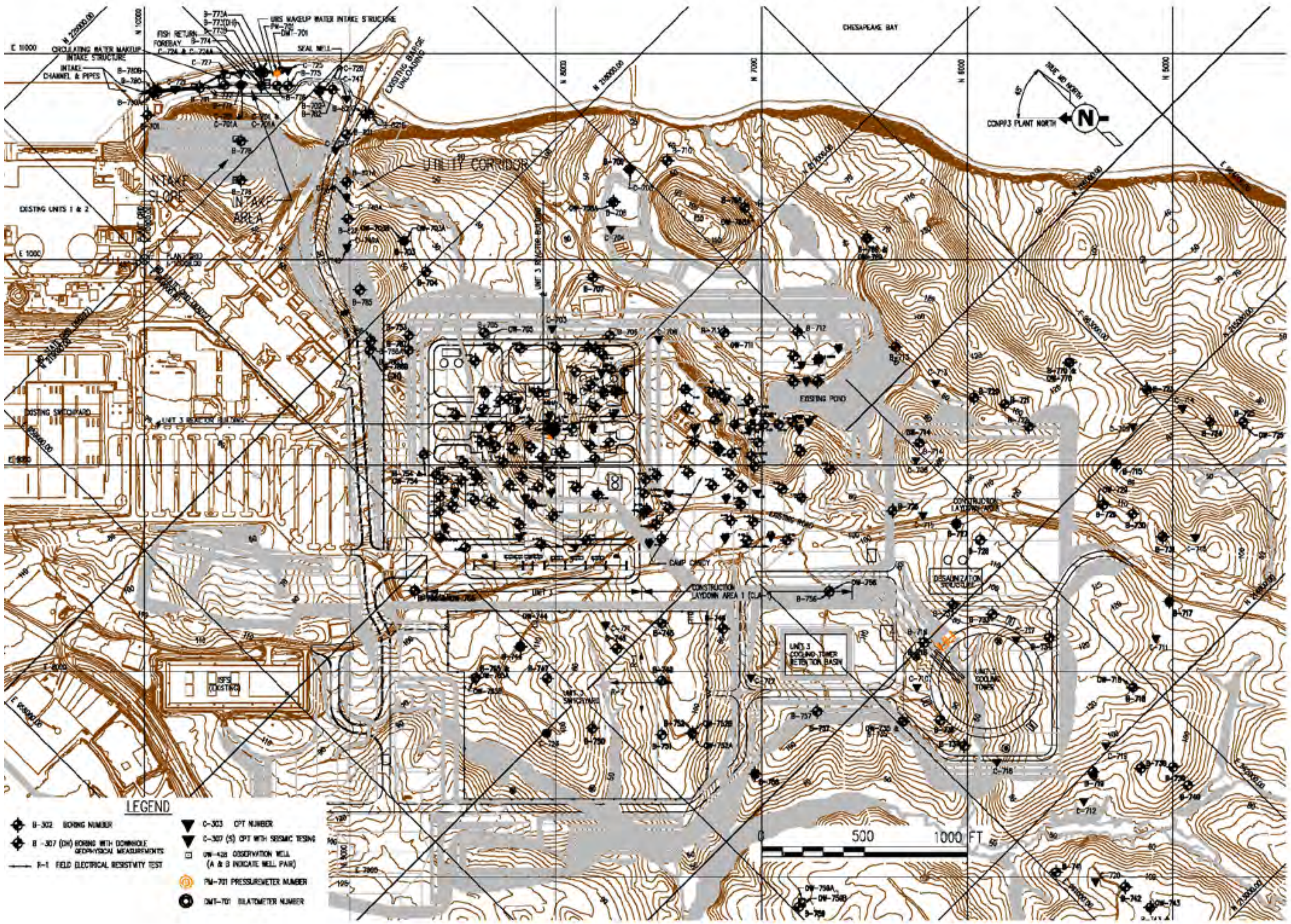
- Phase I – 2006
  - Initial investigation effort and reported in Subsurface Investigation Data Reports (Schnabel, 2007a) (Schnabel, 2007b); the investigation includes the boring program for the CCNPP Unit 3 and laboratory testing, including the Resonant Column Torsional Shear (RCTS) tests of the in-situ soils
- Phase II – 2008
  - Drilling and sampling of additional Standard Penetration Test (SPT) borings
  - Installation and Development of additional observation wells
  - Cone Penetration Tests (CPT) with shear wave velocity measurements
  - Borehole geophysical including P-S suspension tests in the Intake Area
  - Pressuremeter tests

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Geotechnical and geophysical site investigations (continued)
  - Phase III – 2009
    - Intake samples laboratory testing, including both static and dynamic RCTS tests
    - Structural fill static testing, including chemical tests, triaxial tests, grain size tests, and Modified Proctor tests
    - Structural fill dynamic testing (RCTS)
    - Installation and Development of additional observation wells

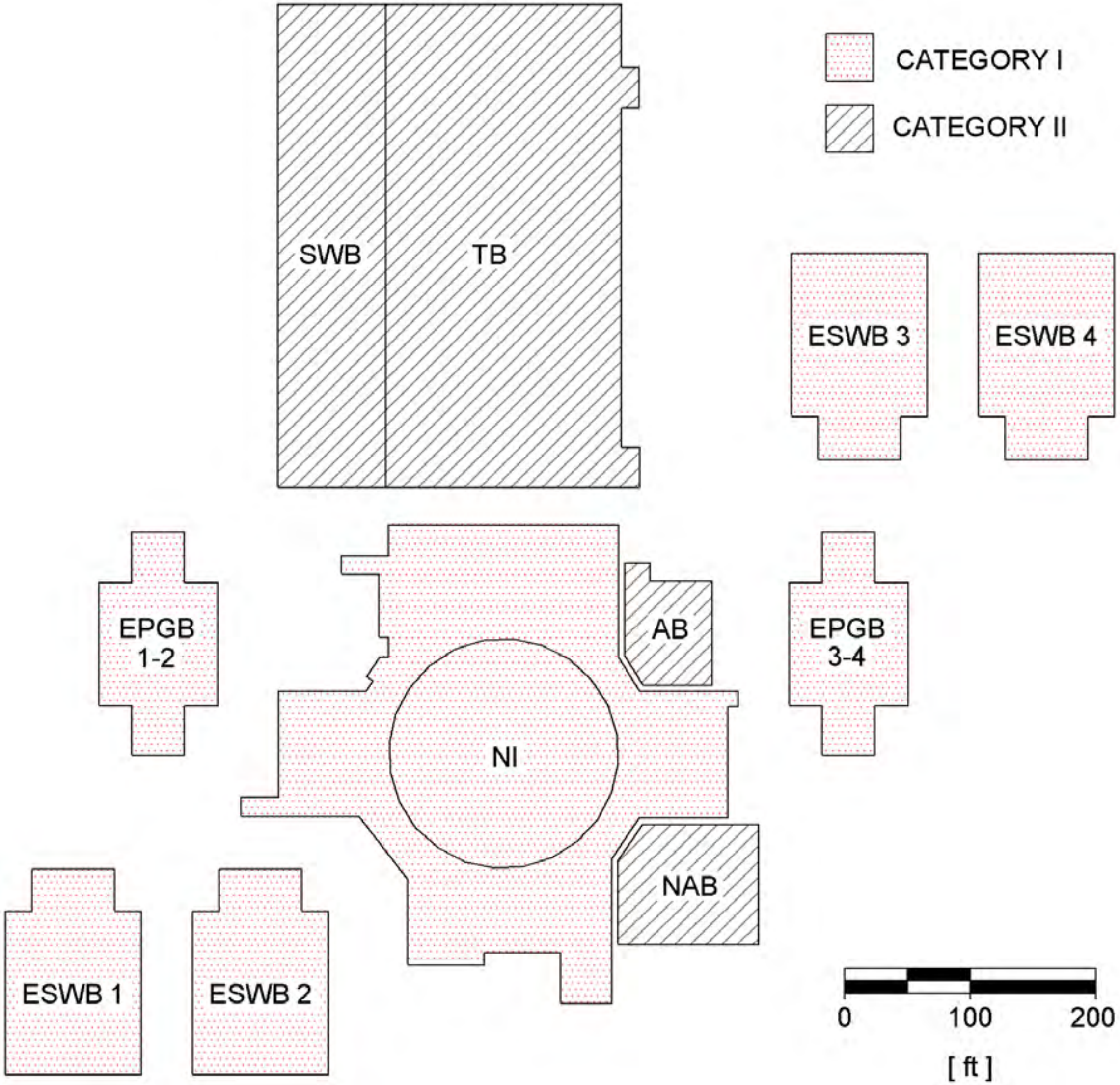
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

Figure 2.5-92— {Site Utilization Plan with Boring Locations}



2.5 Geology, Seismology, and Geotechnical Engineering

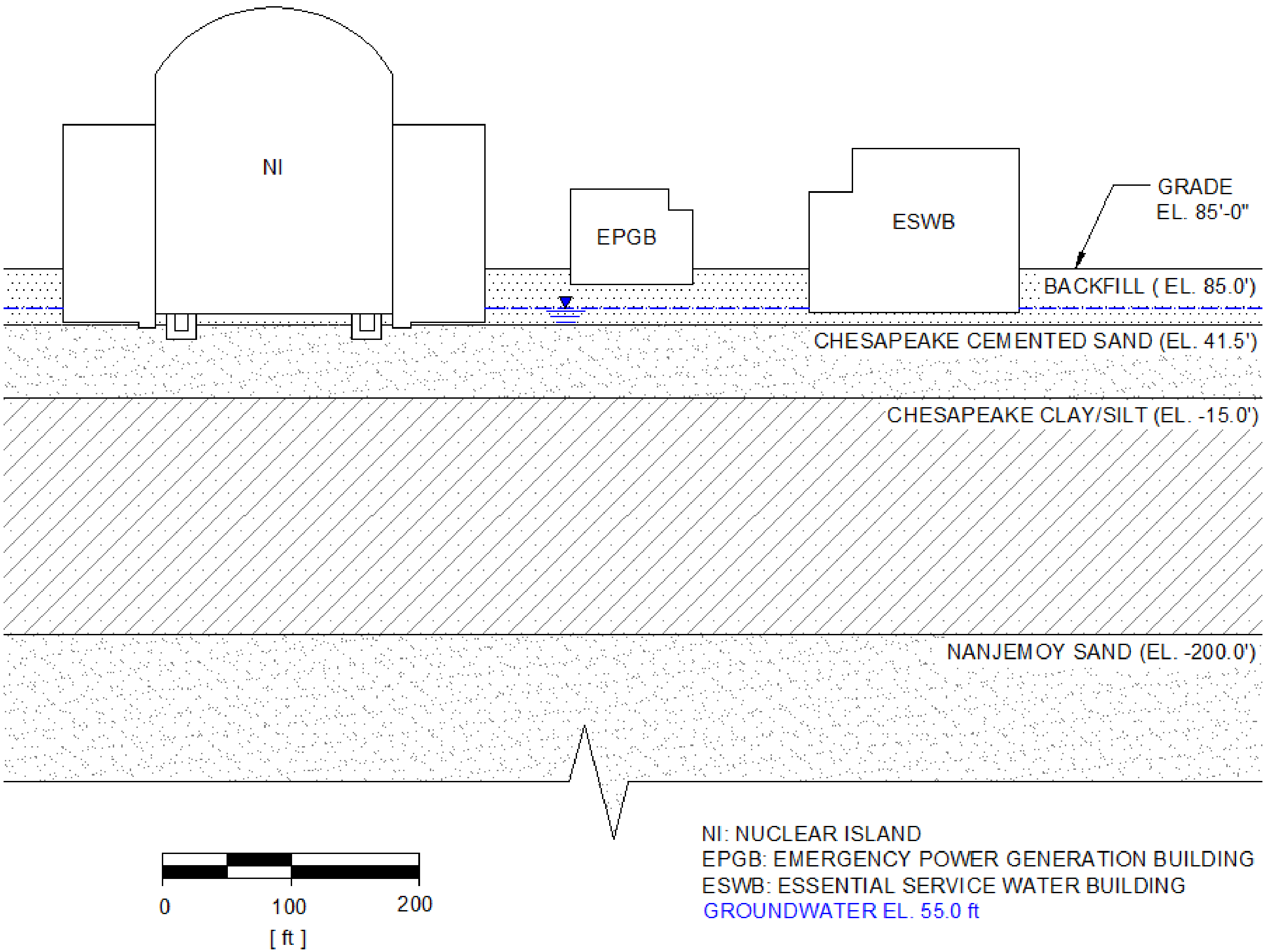
SUBSURFACE CONDITIONS: POWERBLOCK AREA



- NI: Nuclear Island
- ESWB: Essential Service Water Building
- EPGB: Emergency Power Generation Building
- NAB: Nuclear Auxiliary Building
- AB: Access Building
- TI: Turbine Island
  - SWB: Switchgear Building
  - TB: Turbine Building

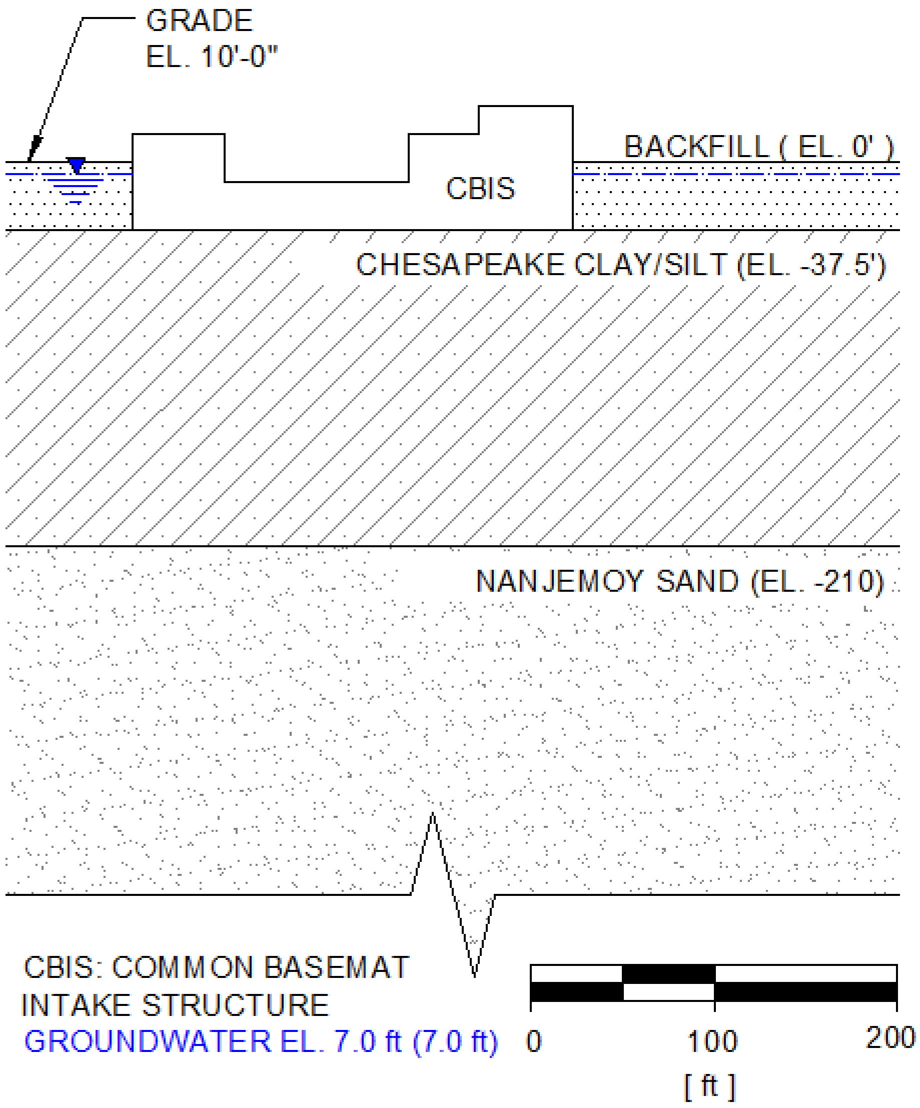
2.5 Geology, Seismology, and Geotechnical Engineering

SUBSURFACE CONDITIONS: POWERBLOCK AREA



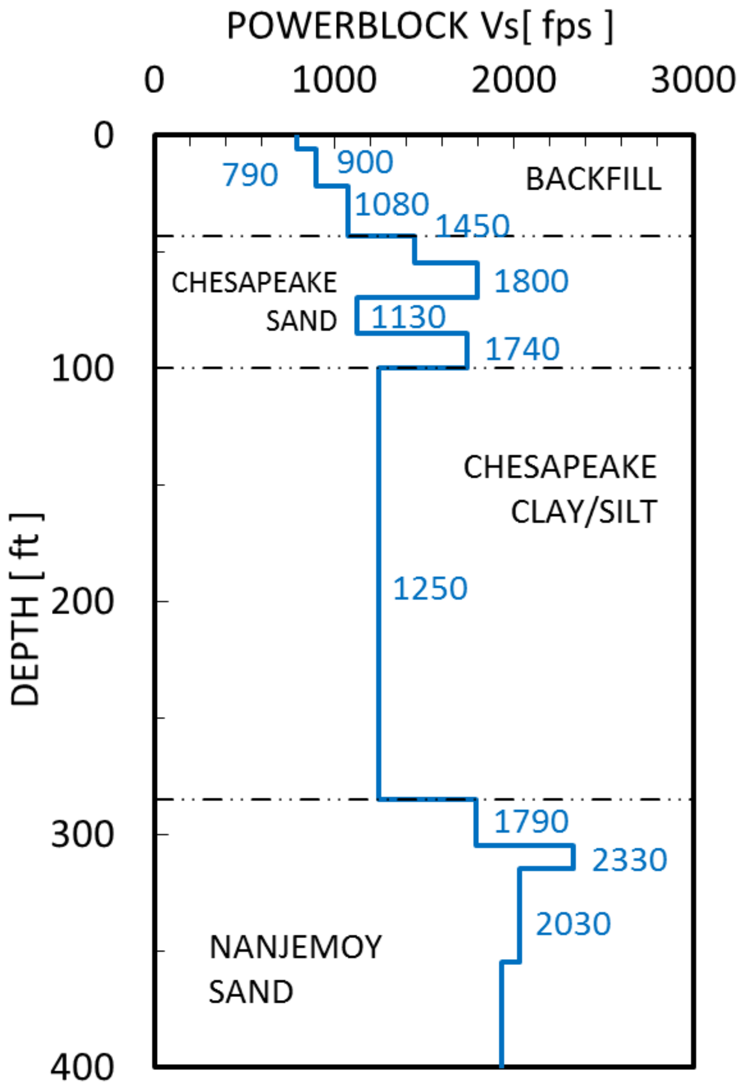
2.5 Geology, Seismology, and Geotechnical Engineering

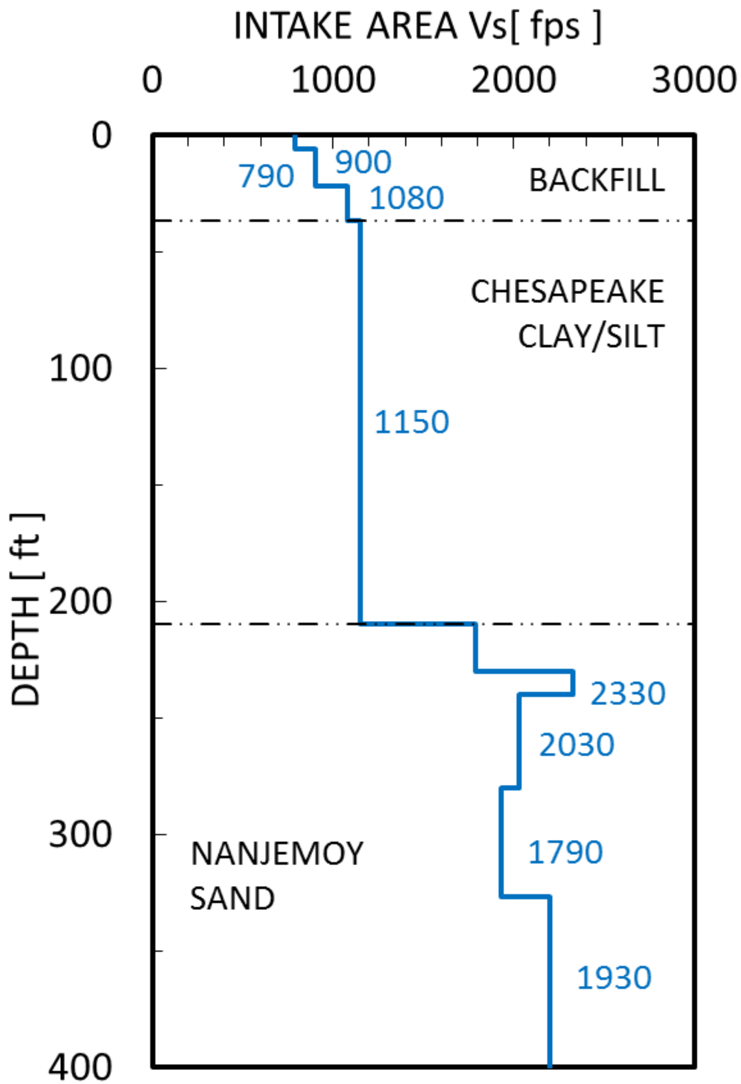
SUBSURFACE CONDITIONS: INTAKE AREA



2.5 Geology, Seismology, and Geotechnical Engineering

SUBSURFACE CONDITIONS: SHEAR WAVE VELOCITY





2.5 Geology, Seismology, and Geotechnical Engineering Departure/Exemption

<u>Departure/Exemption from Minimum Shear Wave Velocity</u>

- Departure/Exemption: Low Strain Shear Wave Velocity
  - The shear wave velocity (LOW STRAIN), at the foundation elevation of the Emergency Power Generation Buildings (EPGBs), is lower than 1000 fps, which is the minimum requirement defined by the U.S. EPR.
  - This departure/exemption is reconciled in FSAR Section 3.7 with a site-specific soil structure (SSI) interaction analysis

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL will reconcile the site-specific soil and backfill properties with those used for design of U.S. EPR Seismic Category I structures and foundations described in Section 3.8.

➢ A comprehensive field investigation and associated laboratory testing has been performed for the CCNPP Unit 3 site backfill soils

  - Bulk samples from borrow areas
  - Resonant Column Torsional Shear (RCTS) tests have been performed to measure shear wave velocity as a function of seismically induced strain
  - Modified proctor compaction tests have been performed to establish the optimum density for placement

➢ The properties of the backfill are reconciled against the U.S. EPR by performing a full site specific SSI analysis and stability analysis of Category I structures (Section 3.7)

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL applicant will verify that site-specific foundation soils beneath the foundation basemats of Seismic Category I and the NAB structures have the capacity to support the bearing pressure with a factor of safety of 3.0 under static conditions, or 2.0 under dynamic conditions, whichever is greater.

➢ The ultimate bearing capacity of safety-related buildings for the Powerblock and Intake Areas is estimated using the closed form solutions proposed by Vesic and Meyerhof. Factors of safety are obtained for different soil profile cases and compared with standard practice allowable values

➢ Site-specific static and dynamic bearing capacities will be evaluated to the values listed in the US EPR FSAR Table 2.1-1

➢ Confirmation will be performed based on a factor of safety of 3.0 (static) and 2.0 (dynamic), that the site provides adequate allowable bearing capacity

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL will provide an assessment of predicted settlement values across the basemat of Seismic Category I structures during and post construction. The assessment will address both short term (elastic) and long term (heave and consolidation) settlement effects with the site specific soil parameters, including the soil loading effects from adjacent structures.
- A COL applicant will verify that the predicted tilt settlement value of ½ inch per 50 ft in any direction across the foundation basemat of a Seismic Category I structure is not exceeded. Settlement values larger than this may be demonstrated acceptable by performing additional site specific evaluations.

➢ The surface topography and subsurface conditions of the CCNPP Unit 3 Powerblock Area make the estimation of settlement and building tilt complex. The objective of the settlement analysis of the CCNPP Powerblock Area is to provide an estimate of the time dependent settlement and heave distribution throughout the footprint of the Powerblock Area, including maximum settlement and tilt estimated for each of the facilities

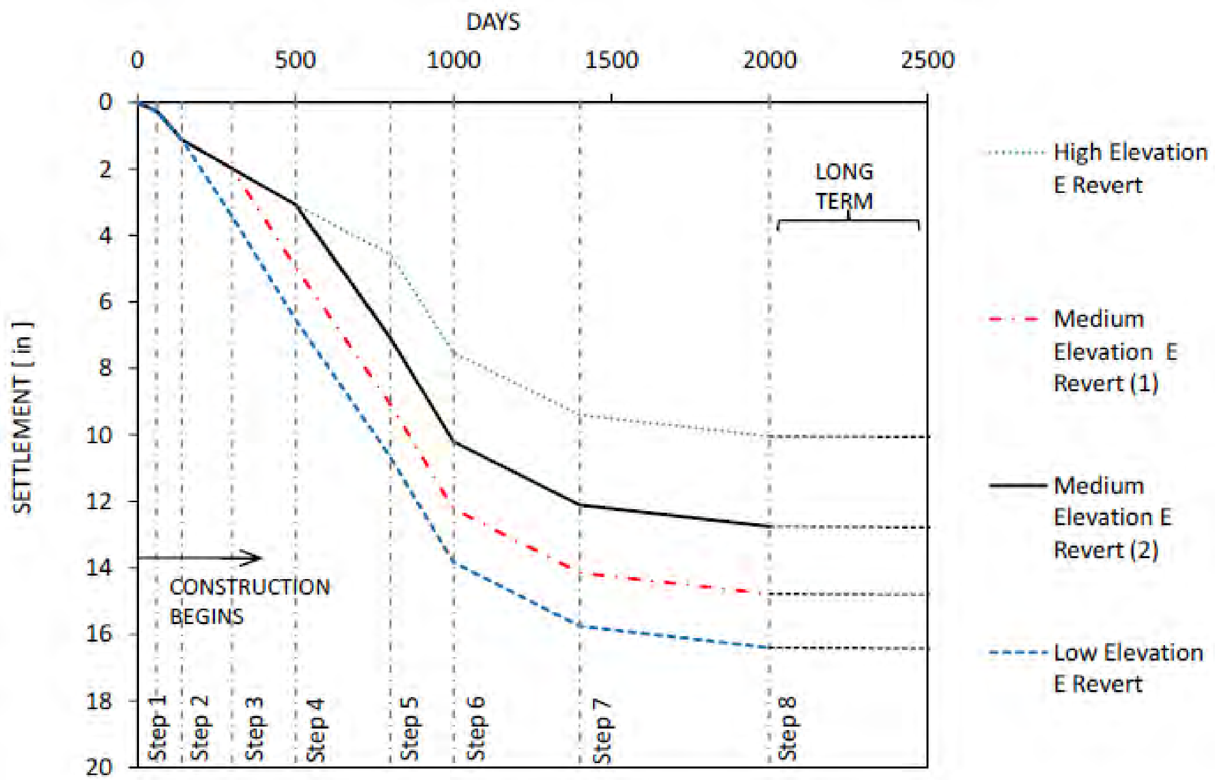
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Settlement
  - The settlement analysis of the CCNPP Powerblock Area was carried out under the following premises:
    - ✓ Develop a three-dimensional model capable of capturing irregular subsurface conditions, realistic foundation footprint shapes, and asymmetric building loads;
    - ✓ Perform a time-dependent simulation, that provides settlement and tilt estimates as a function of time through and after construction;
    - ✓ Incorporate a construction sequence and examine the behavior of settlement and tilt as buildings are erected;
    - ✓ Account for asymmetric topography, by recognizing that reloading time to original consolidation pressure after excavation will be variable throughout the foundation footprint;
    - ✓ Perform the settlement analysis simultaneously for the NI and adjacent facilities, including the detached safety related structures (EPBG and ESWB);

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Settlement (continued)
  - A Finite Element Method (FEM) model of the subsurface and structural interfaces was developed.
  - Two separate models were developed for the CCNPP Powerblock Area:
    - ✓ 1. An Excavation and Dewatering Model (ED Model).
    - ✓ 2. Construction and Post-Construction Model (CPC Model).
  - The settlement model in the Intake Area is developed in a similar form. The model is much simpler and the influence of neighboring structures is negligible.
- Settlement Monitoring
  - A settlement monitoring program will be enforced to record heave of the excavation bottom, the effect of dewatering and the effect of Nuclear Island Basemat loading during and after construction.
    - ✓ Confirm that field observations of heave and settlement are consistent with estimates
    - ✓ Assess and document the actual settlements in comparison with the predicted and the acceptable limits

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items



Notes:

- *Low Elevation: revert to loading modulus at the end of the 2nd load step (140 days)*
- *Medium Elevation (1): revert to loading modulus at the end of the 3rd load step (300 days)*
- *Medium Elevation (2): revert to loading modulus at the end of the 4th load step (500 days)*
- *High Elevation: revert to loading modulus at the end of the 5th load step (800 days)*
- *Long term settlement estimate due to creep and rewatering offset each other and are not significant*

2.5 Geology, Seismology, and Geotechnical Engineering Departure/Exemption

<u>Departure/Exemption from Maximum Differential Settlement of 1/2 inch/50 ft (1/1200) Any Direction Across the Basemat</u>

- Emergency Power Generating Buildings (EPGBs) & Essential Service Water Buildings (ESWBs) estimated site-specific differential settlement is higher than the allowable value.
- This Departure/Exemption is reconciled in FSAR Section 3.7

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL applicant will investigate and determine the uniformity of the soil layer(s) underlying the foundation basemats of Seismic Category I structures.

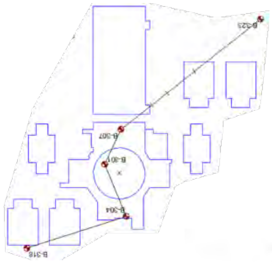
➢ Three criteria are identified in the U.S. EPR FSAR for establishing uniformity in foundation support media

- 1) Presence of soil and rock
- 2) Dip angle of soil layers
- 3) Shear wave velocity

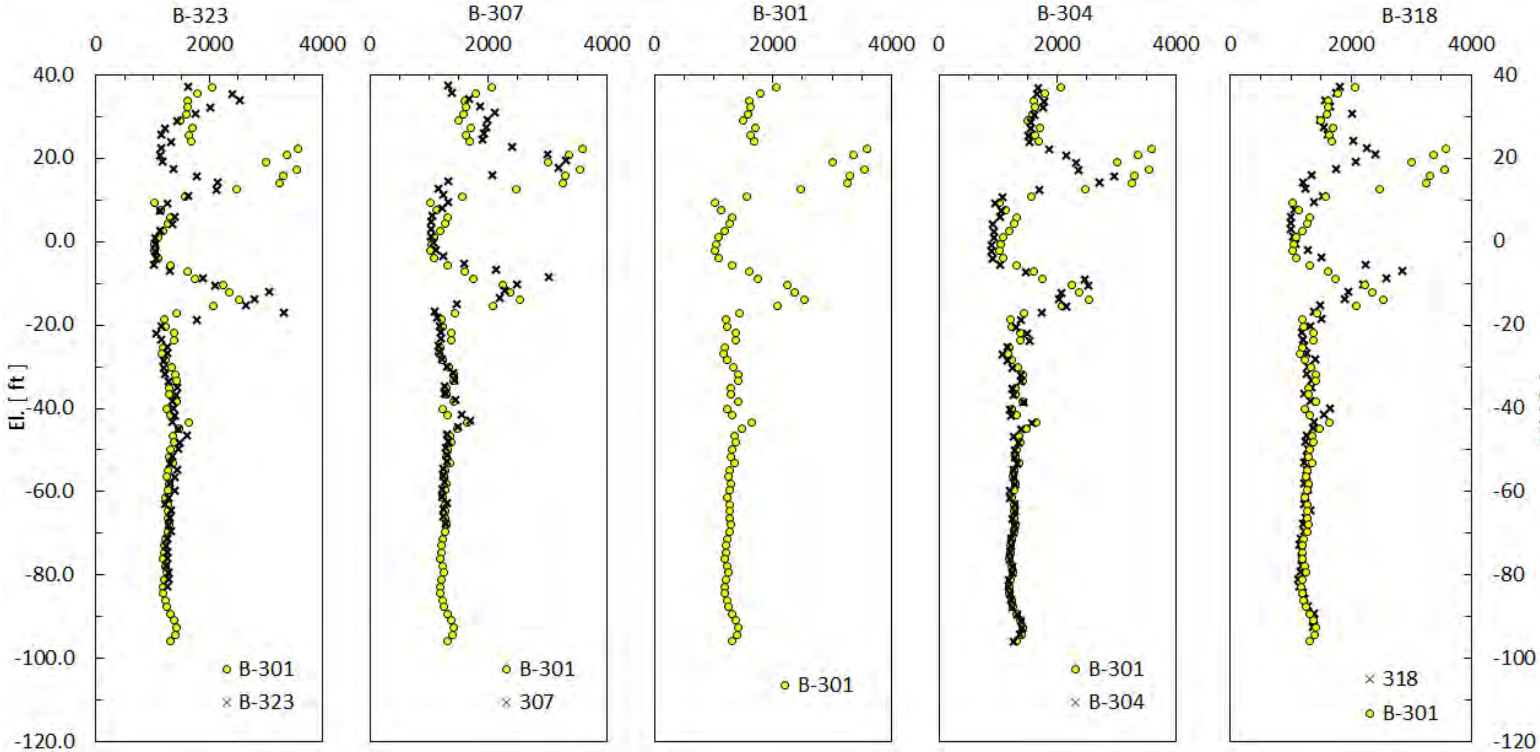
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Presence of soil and rock
  - Foundations of all Seismic Category I structures at the CCNPP Unit 3 site are supported on compacted structural fill which is in turn supported on native soils
  - Bedrock at the site is very deep, at about 2,500 ft below ground surface
  - Given the considerable depth to bedrock, non-uniform foundation conditions resulting from combined soil-rock support are not applicable to foundations at the CCNPP Unit 3 site
- Dip angle of soil layers
  - Stratigraphic profiles indicate that the stratigraphic lines delineating various soil units have gentle slopes, mostly sloping about 1 to 2 degrees
  - The soil layers at the CCNPP Unit 3 site are considered horizontal
- Shear wave velocity
  - The shear wave velocity measurements clearly indicate the presence of uniform subsurface conditions
  - For engineering analyses purposes, the shear wave velocity profiles are equivalent and the substrata can be considered uniform
  - This conclusion is supported by the information and analysis provided in Section 2.5.4.2.2.2

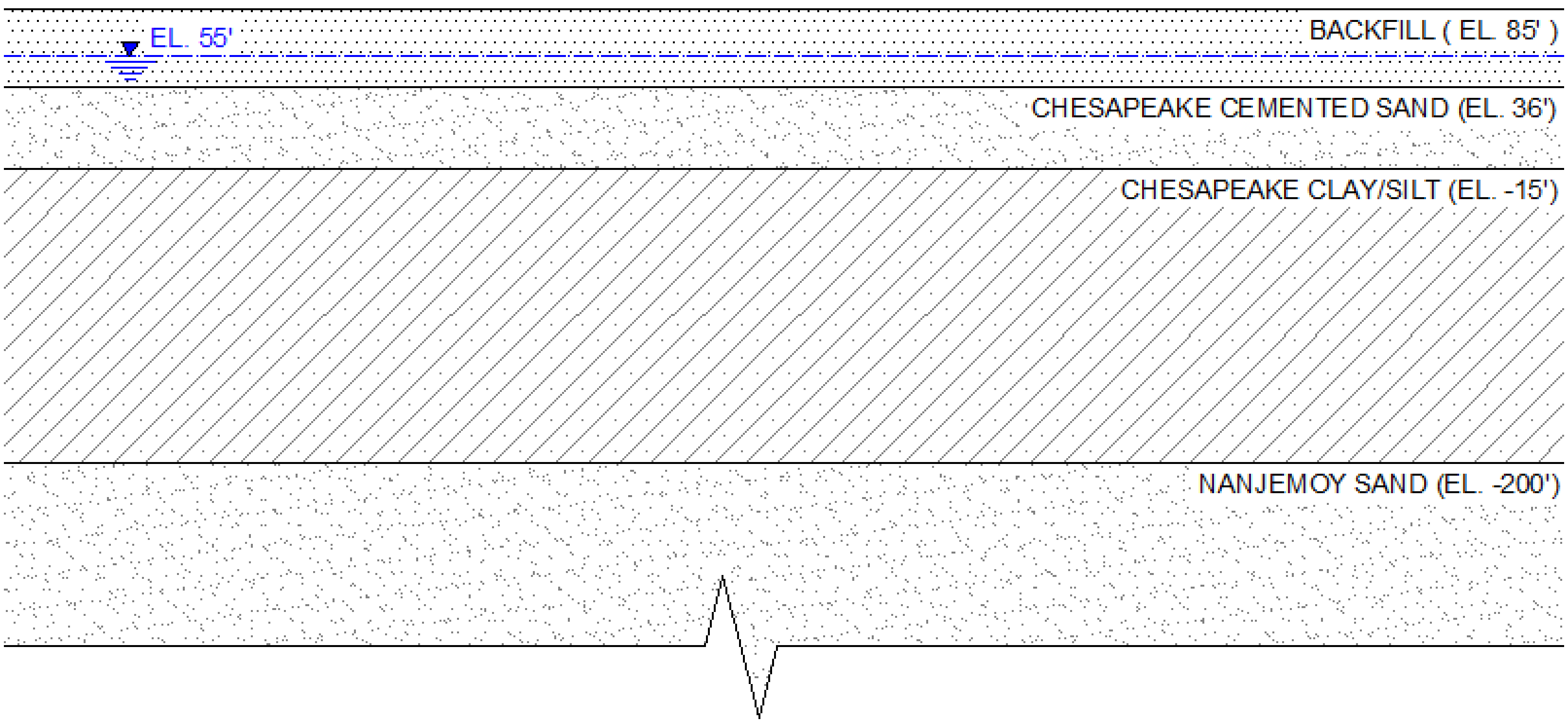
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items



- CCNPP Unit 3 is considered a Uniform Site



2.5 Geology, Seismology, and Geotechnical Engineering
COL Information Items
SUBSURFACE CONDITIONS: UNIFORMITY



2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- A COL applicant will evaluate site-specific information concerning the stability of earth and rock slopes, both natural and manmade (e.g., cuts, fill, embankments, dams, etc.), of which failure could adversely affect the safety of the plant.

➢ This section addresses the stability of constructed and natural slopes

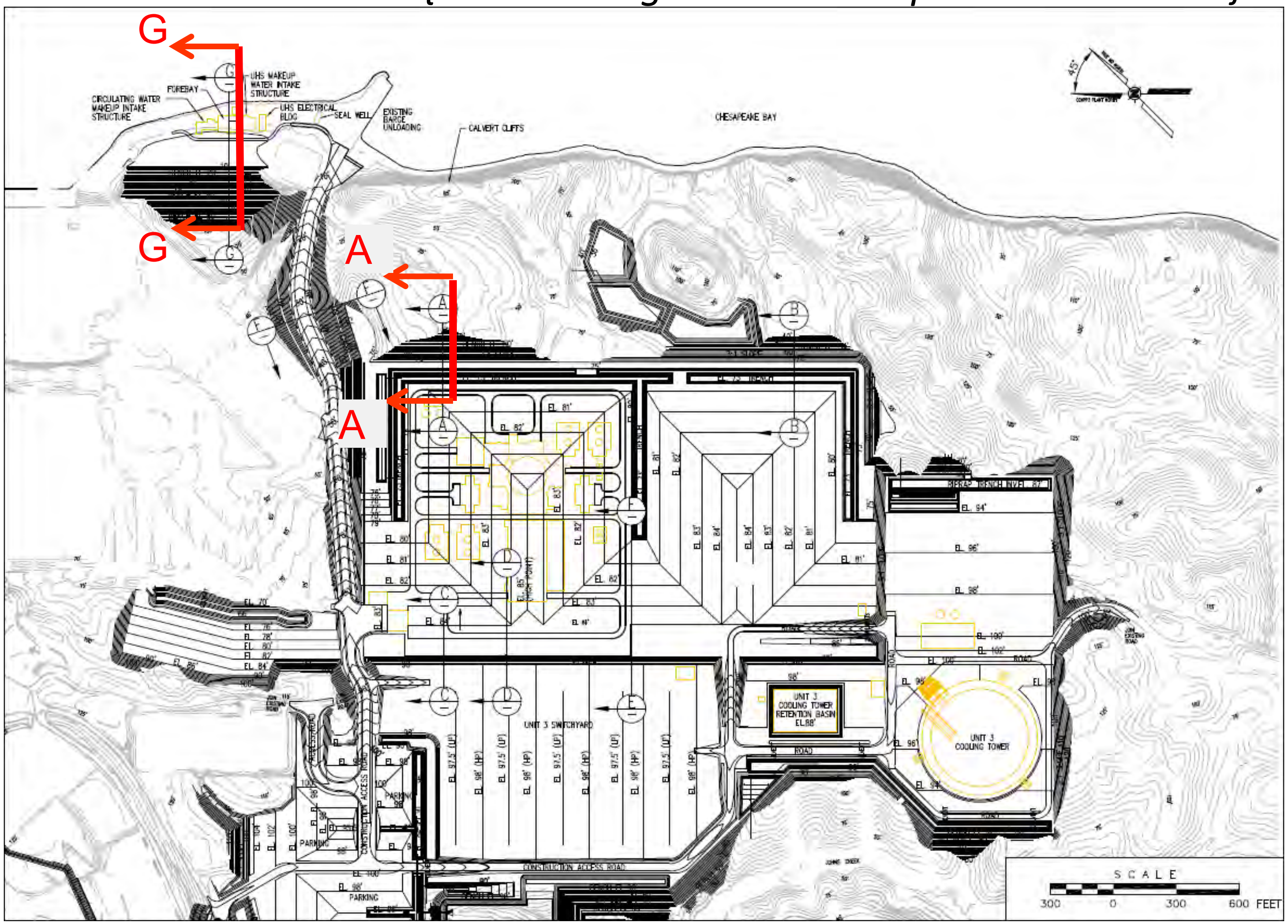
➢ Prepared based on the guidance in relevant sections of NRC Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants"

➢ Constructed slopes evolve as part of the overall site development

➢ Stability of constructed slopes
  - The stability of constructed slopes was assessed using limit equilibrium methods, which generally consider moment or force equilibrium of a potential sliding mass by discretizing the mass into vertical slices
  - The calculated FOSs for all slopes exceed the minimum acceptable values.
  - Therefore, the slopes in the Powerblock, intake area and utility corridor have sufficient static and dynamic stability against slope failure

2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

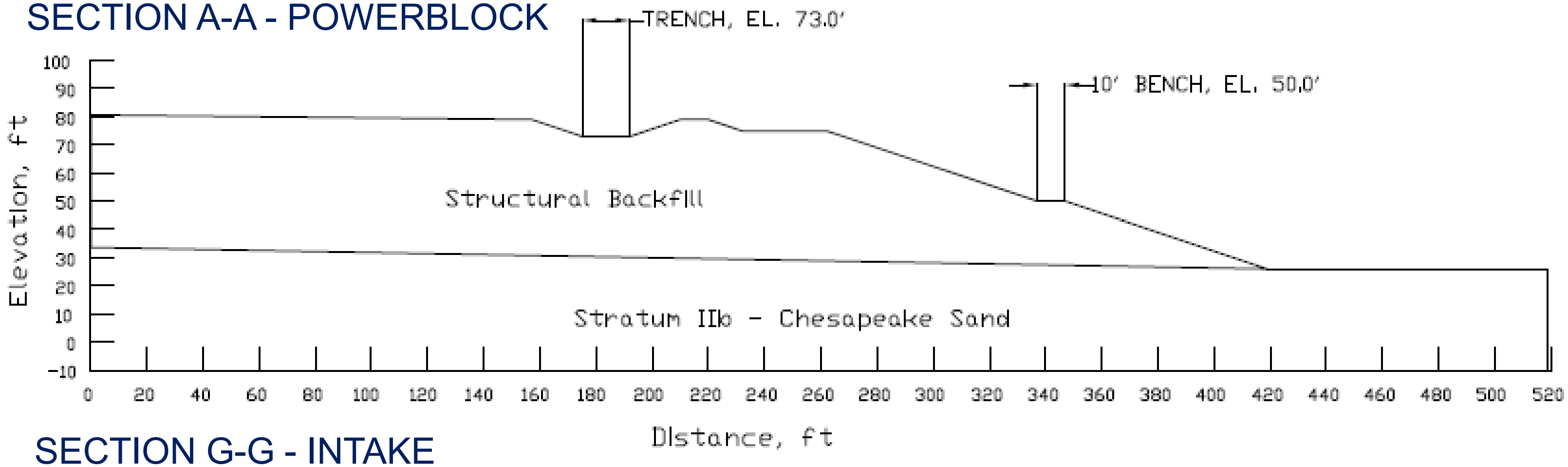
FIGURE 2.5-186 {Site Grading Plan with Slope Cross-Sections}



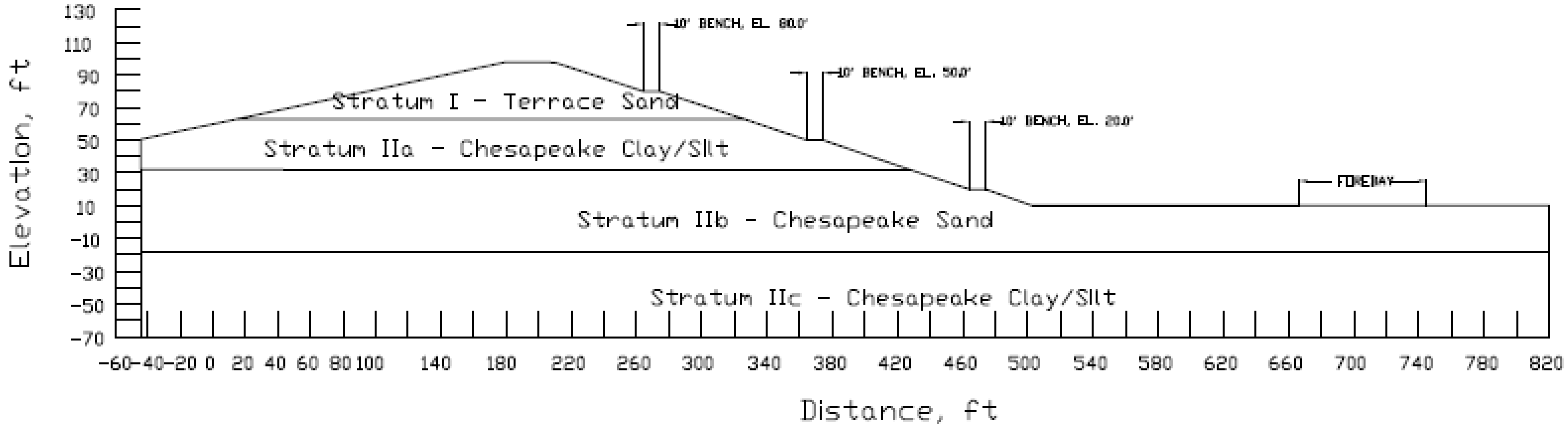
2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

2.5.5, STABILITY OF SLOPES, SECTIONS A and G

SECTION A-A - POWERBLOCK



SECTION G-G - INTAKE



2.5 Geology, Seismology, and Geotechnical Engineering COL Information Items

- Stability of Natural Calvert Cliffs Slopes
  - The Calvert Cliffs are steep, near-vertical slopes, formed by erosion processes over the last several thousand years.
  - Given the past performance of the high cliffs, there is no reason to expect their future performance would appreciably differ; therefore, these cliffs are anticipated to continue to be globally stable, owing to the relatively high strength of the soil deposits that make up the cliffs.
- Summary
  - The constructed and natural slopes at the site are sufficiently stable and present no failure potential that would adversely affect the safety of the proposed CCNPP Unit 3.

CONCLUSIONS

Conclusions

- Two Departures and two Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 2.5.
- No ASLB Contentions
- Eleven (11) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 2.5 FSAR.
- Eight (8) SER-Open Items have been identified. Responses have been submitted.
- One (1) new Request for Additional Information (RAI 390) received (followup to SER-OI). Response is scheduled to be submitted.

Acronyms

- ACI – American Concrete Institute
- ACRS – Advisory Committee on Reactor Safeguards
- ASCE – American Society of Civil Engineers
- ASLB – Atomic Safety & Licensing Board
- ASME – American Society of Mechanical Engineers
- CEUS-Central and Eastern United States
- COL – Combined License
- COLA – COL Application
- CPT – Cone Penetration Test
- CSDRS – Certified Seismic Design Response Spectra
- CVSZ – Central Virginia Seismic Zone
- DOE – Department of Energy
- ECL – Effluent Concentration Limits
- EPGB – Emergency Power Generating Building
- EPRI – Electric Power Research Institute
- ESWB – Essential Service Water Building
- FIRS – Foundation Input Response Spectra
- FOS – Factor of Safety
- FSAR – Final Safety Analysis Report
- GMC – Ground Motion Characterization
- GMRS – Ground Motion Response Spectra
- IBR – Incorporate by Reference
- ISRS – In-Structure Response Spectra
- MVE – Mineral Virginia Earthquake
- MWIS – Makeup Water Intake Structure
- NAB – Nuclear Auxiliary Building
- NI – Nuclear Island
- PSHA – Probabilistic Seismic Hazard Assessment
- RAI – Request for Additional Information
- RCOLA – Reference COL Application
- RCTS – Resonant Column Torsional Shear
- SB – Safeguards Building
- SER – Safety Evaluation Report
- SPH – Standard Project Hurricane
- SPT – Standard Penetration Test
- SSC – Seismic Source Characterization
- SSCs – Structures, Systems and Components
- SSE – Safe Shutdown Earthquake
- SSI – Soil Structure Interaction

UNISTAR NUCLEAR ENERGY

Presentation to ACRS
U.S. EPR™ Subcommittee
Calvert Cliffs Nuclear Power Plant Unit 3
FSAR Chapter 13
Conduct of Operations
May 8, 2013

Chapter 13, Conduct of Operations Introduction

- RCOLA authored using ‘Incorporate by Reference’ (IBR) methodology.
- To simplify document presentation and review, only supplemental information, site-specific information, or departures/exemptions from the U.S. EPR FSAR are contained in the COLA.
- AREVA U.S. EPR FSAR ACRS Meeting for Chapter 13, Conduct of operations occurred on November 30, 2010.

Chapter 13, Conduct of Operations Introduction

- No ASLB Contentions identified for Chapter 13
- No Departures/Exemptions from the U.S. EPR FSAR Chapter 13 for the Calvert Cliffs Unit 3 COLA.
- Twelve COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 13.

Chapter 13, Conduct of Operations Introduction

- Today Mark Finley, UniStar Senior Vice President, Regulatory Affairs & Engineering, will present the Calvert Cliffs Unit 3 FSAR Chapter 13.
- Today's presentation was prepared by UniStar and is supported by:
  - Douglas Schweers, UniStar – Security Manager
  - Mark Hunter, UniStar – Director Operations and Maintenance
  - Scott McCain, Emergency Preparedness Engineer – Contingency Management Consulting Group LLC
- The focus of today's presentation will be on site-specific information that supplements the U.S. EPR FSAR.

Chapter 13 Conduct of Operations Agenda

- 13.1 Organizational Structure of Applicant
- 13.2 Training
- 13.3 Emergency Planning
- 13.4 Operational Program Implementation
- 13.5 Plant Procedures
- 13.6 {Security}
- 13.7 Fitness for Duty
- 13.8 Cyber Security
- Conclusions

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT
COL Information Items

- A COL applicant will provide site-specific information for management, technical support and operating organizations. The operating organization describes the structure, functions and responsibilities established to operate and maintain the plant.

➢ Organizational Structure

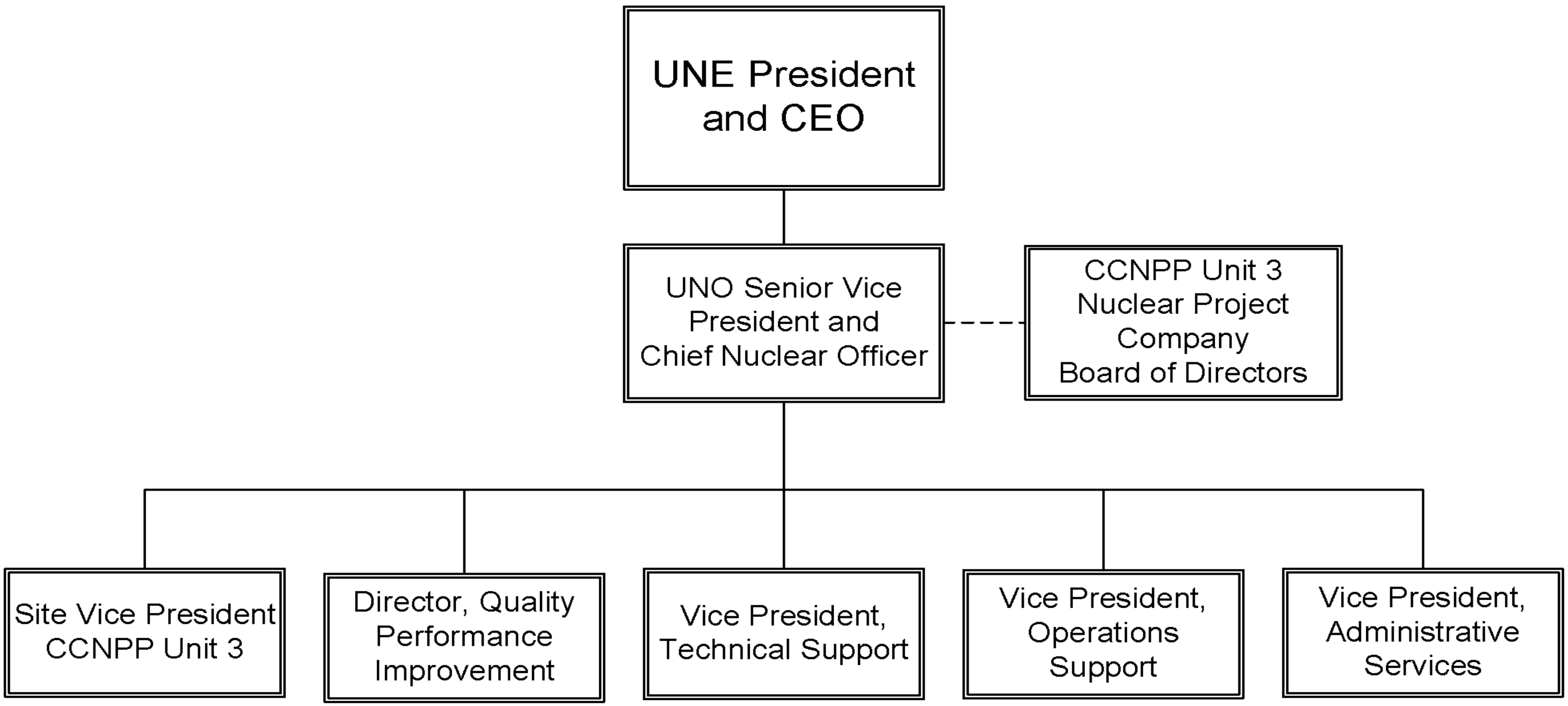
  - UniStar Nuclear Energy, LLC President and Chief Executive Officer, is responsible for:
    - All aspects of operations and governance of UNE nuclear operations
    - Technical and administrative support provided by UNE, its affiliated companies, and non-affiliated contractors
    - Siting, design, fabrication, construction, and safe reliable operation of Calvert Cliffs Unit 3, including management oversight and support of the day-to-day station operations
    - Setting and implementing policies, objectives, expectations, and priorities to ensure activities are performed in accordance with the highest levels of safety, the quality assurance program

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT
COL Information Items

- Organizational Structure (Continued)
  - UniStar Nuclear Operating Services, LLC
    - Will be the project owners' agent for plant acceptance
    - Will commission, operate, and maintain Calvert Cliffs Unit 3 by using and sharing a standardized set of services, procedures, and management practices with other EPR owners
    - Will use "lessons learned" from operating EPRs to drive continuous improvement and maintain standard processes
    - Will provide trained manpower for the startup, test, commissioning, maintenance and operation of the plants
    - Will provide performance improvement and quality control oversight of UNE, the AE, and NSSS supplier design, procurement, and construction activities in accordance with the UniStar Quality Assurance

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT
COL Information Items

UNO Corporate Organization



13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT
COL Information Items

- Operating Organization
  - Site Organization
    - Includes operations, maintenance, radiological protection, chemistry, work management, engineering, training, and quality and performance improvement.
    - Is responsible for ensuring quality assurance and implementation of administrative controls necessary to ensure nuclear safety, industrial safety, and radiation protection as specified in the Quality Assurance Program Description
    - Is responsible for reporting problems with plant equipment, facilities, and human performance
    - Ensures rules of practice are met through the use of procedures and other administrative controls (such as policies and guidelines)

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT
COL Information Items

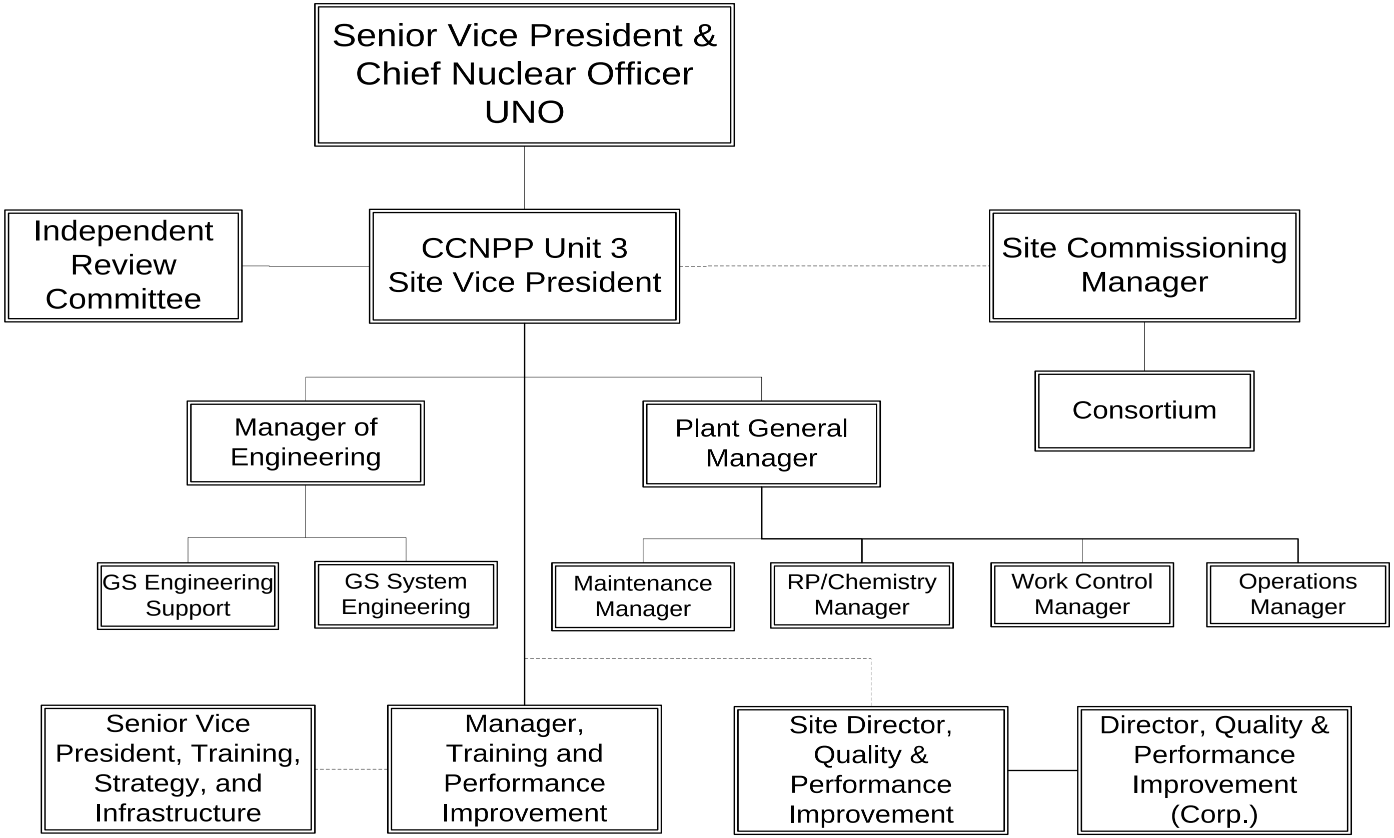
- Operating Organization (continued)
  - Site Organization (continued)
    - Calvert Cliffs Unit 3 Site Vice President
      - Has overall responsibility for station operation
      - Is responsible for overall plant nuclear safety, implementation of the UniStar Nuclear QAPD, and management and direction of safe, efficient, and reliable operation
      - Is responsible for the station's compliance with its NRC Combined License, governmental regulations, and ASME Code requirements. Additionally, has overall responsibility for occupational and public radiation safety
      - Direct reports are the Plant General Manager, the Manager of Engineering, and the Manager of Training & Performance Improvement
      - The Independent Review Committee (IRC) also reports to the Site Vice President.

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT
COL Information Items

- Operating Organization (continued)
  - Technical Support for Operations
    - Calvert Cliffs Unit 3 is the first of a planned fleet in the U.S.
    - Two EPRs currently under construction in Europe and two in China
    - Calvert Cliffs Unit 3 will benefit directly from this experience through technical support from the NSSS supplier (AREVA) and from the knowledge and experience gained from Flamanville 3
    - UniStar Nuclear Operating Services, LLC is the operator licensee and is comprised of corporate and site managers, functional managers, supervisors, and technical personnel with sufficient knowledge, training, and experience to perform functions necessary for safe plant operation

13.1 ORGANIZATIONAL STRUCTURE OF APPLICANT
COL Information Items

UNO Site Organization



13.2 TRAINING

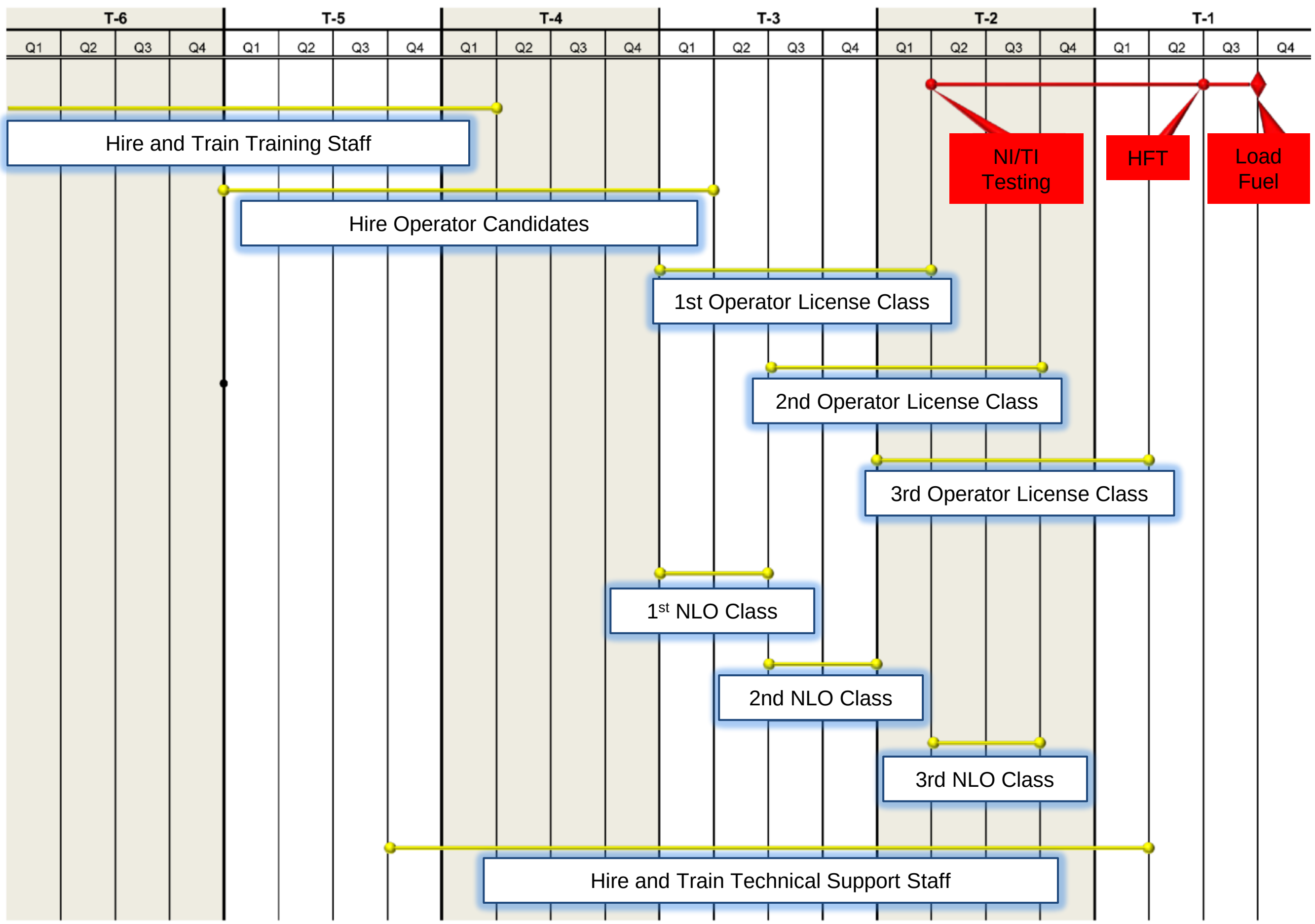
13.2 Training
COL Information Items

- A COL applicant will provide site-specific information for training programs for plant personnel.

➢ Training
- Follows NEI 06-13A "Template for an Industry Training Program Description" including Appendix A (Cold License Training plan) of NEI 06-13A
- Non-licensed Plant Staff Training Program
  - ✓ 18 months prior to scheduled date of initial fuel load
- Reactor Operator Training Program
  - ✓ 18 months prior to scheduled date of initial fuel load

13.2 Training
COL Information Items

Hiring and Training Schedule of Plant Staff



13.2 Training
COL Information Items

- A COL applicant will assess their training program to demonstrate that the spent fuel pool instrumentation will be maintained available and reliable in an extended loss of AC power. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels.

➢ Spent Fuel Pool Instrumentation Training
- License Condition
  - ✓ Training will be developed and implemented to maintain the spent fuel pool instrumentation available and reliable, including the use of alternate power to the safety-related level instrument channels
  - ✓ Provide an overall integrated plan, including a description of how compliance with the requirements will be developed
    - ▪ Submitted to the NRC one (1) year after issuance of the COL.
    - ▪ Initial status report, will be provided to the NRC sixty (60) days following issuance of the COL and at six (6) month intervals following submittal of the overall integrated plan.

Chapter 13 Conduct of Operations

13.3 EMERGENCY PLANNING

13.3 Emergency Planning
COL Information Items

- A COL applicant will provide a site-specific emergency plan in accordance with 10 CFR 50.47 and 10 CFR 50 Appendix E.

➢ Emergency Planning
  - A comprehensive Emergency Plan is provided in COLA Part 5, Emergency Plan.
  - Rev 8 Emergency Plan for CC3 was issued April 30, 2013
  - Emergency Plan incorporates new EP Rule Hostile action requirements
  - NEI 10-05 for staffing analysis has been addressed
  - NUREG 0654\FEMA Rep-1 requirements have been incorporated

13.3 Emergency Planning COL Information Items

- A COL applicant will address the requested information in Fukushima Recommendation 9.3 regarding Emergency Preparedness Communications and Staffing pursuant to the 10 CFR 50.54(f) letter dated March 12, 2012.

➢ Emergency Planning
- At least two (2) years prior to scheduled initial fuel load,
  - ✓ Perform an assessment of the on-site and augmented staffing capability to satisfy the regulatory requirements for response to a single-unit event
    - ❖ In accordance with NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities”
  - ✓ Revise the Emergency Plan to include the following:
    - ❖ Incorporation of corrective actions identified in the staffing assessment
    - ❖ Identification of how the augmented staff will be notified given degraded communications capabilities.

13.3 Emergency Planning COL Information Items

- Emergency Planning (continued)
  - At least two (2) years prior to scheduled initial fuel load,
    - ✓ Perform an assessment of on-site and off-site communications systems and equipment required during an emergency event to ensure communications capabilities can be maintained during prolonged station blackout conditions.
      - In accordance with NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities”
    - ✓ At least one hundred eighty (180) days prior to scheduled initial fuel load, incorporate corrective actions identified in the staffing assessment into:
      - Emergency plan and implementing procedure changes and associated training.

13.4 OPERATIONAL PROGRAM IMPLEMENTATION

13.4 Operational Program Implementation COL Information Items

- A COL applicant will provide site-specific information for operational programs and schedule for implementation.

➢ Operational Program Implementation

- Calvert Cliffs Unit 3 FSAR lists each operational program, and
  - The regulatory source of the program
  - The section of the FSAR which describes the program
  - The associated milestones
- Are required by regulation and subject to program implementation license conditions

13.4 Operational Program Implementation COL Information Items

Operational Programs

Calvert Cliffs Unit 3 Programs			
In-service Inspection	In-service Testing	Environmental Qualification	Preservice Inspection
Reactor Vessel Material Surveillance	Preservice Testing	Containment Leakage Rate Testing	Fire Protection
Process and Effluent Monitoring and Sampling	Radiological Effluent Technical Specifications	Offsite Dose Calculation Manual	Radiological Environmental Monitoring
Process Control	Radiation Protection	Non-licensed Plant Staff Training	Reactor Operator Training
Reactor Operator Requalification	Emergency Plan	Security Program	Physical Security
Safeguards Contingency	Security Training and Qualification	Cyber Security Plan	Fitness for Duty
Quality Assurance	Maintenance Rule	Motor-Operated Valve Testing	Initial Test

Chapter 13 Conduct of Operations

13.5 PLANT PROCEDURES

13.5 Plant Procedures
COL Information Items

- A COL applicant will provide site-specific information for administrative, operating, emergency, maintenance and other operating procedures.

➢ Plant Procedures

- Site-specific procedures for administrative, operating, emergency, maintenance, chemistry, security, plant modification and radiation protection will be provided
- RG 1.33, Revision 2 is used as guidance for the preparation
- A detailed Writer's Guide will be developed which ensures each procedure is sufficiently detailed, consistently formatted and complies with Human Factors Engineering principles
- Will be reviewed, approved and controlled to the requirements of the UniStar Quality Assurance Program Description (QAPD)
- The responsible department head is charged with the preparation of procedures within area of activity
- Procedures will be developed and issued well ahead of the project milestones (i.e.- 6 months before start of first licensed operator training class)

13.5 Plant Procedures
COL Information Items

- Plant Procedures (continued)
  - Operation procedures will be developed consistent with:
    - ✓ NUREG-0800 Section 13.5
    - ✓ Babcock & Wilcox (B&W) Technical Basis Document,
      - Symptom Based Procedures
    - ✓ Pressurized Water Reactor Owner's Group (PWROG) Writer's guide,
      - Template format
    - ✓ Operating Strategies for Severe Accidents Methodology for the U.S. EPR Technical Report, AREVA NP Inc.,(OSSA),
      - Emergency Operating Procedures,
      - Abnormal Operating Procedures
      - Severe Accident Mitigation Guidelines.

Chapter 13 Conduct of Operations

13.6 SECURITY

(Not Included in ACRS Presentation)

13.7 FITNESS FOR DUTY

13.7 Fitness for Duty
COL Information Items

- A COL applicant will submit a Physical Security Plan to the NRC to fulfill the fitness for duty requirements of 10 CFR Part 26.

- Fitness for Duty Program (FFD)
  - Implemented and maintained in multiple and progressive phases dependent on the activities, duties, or access afforded to certain individuals at the construction site
  - Construction FFD program
    - Consistent with NEI 06-06
    - Management and oversight personnel and security personnel prior to the receipt of special nuclear material in the form of fuel assemblies
    - At the establishment of a protected area, persons who are granted unescorted access will meet the requirements of an operations FFD program
  - Operations FFD program
    - Consistent with 10 CFR Part 26

13.8 CYBER SECURITY

13.8 Cyber Security
COL Information Items

- A COL applicant will provide a cyber security plan consistent with 10 CFR 73.54.
- The Cyber Security Plan, consistent with Regulatory Guide 5.71 addresses the requirements 10 CFR 73.54 by achieving high assurance that the following are adequately protected against cyber attacks up to and including the Design Basis Threat (DBT):
  - Digital computers
  - Communication systems
  - Networks associated with safety, security, and emergency preparedness (SSEP) functions a.k.a. Critical Digital Assets (CDAs),
- Actions to provide high assurance of adequate protection of systems associated with the above functions from cyber attacks are accomplished by:
  - Implementing and documenting the "baseline" security controls described in Section C.3.3 of RG 5.71, and
  - Implementing and documenting the Cyber Security Program to maintain the established cyber security controls through a comprehensive life cycle approach, as described in Section 1.4 of RG 5.71.

Chapter 13 Conduct of Operations

CONCLUSIONS

Chapter 13 Conduct of Operations Conclusions

- No ASLB Contentions identified for Chapter 13
- No Departures/Exemptions from the U.S. EPR FSAR Chapter 13 for the Calvert Cliffs Unit 3 COLA.
- Twelve COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 13.
- Six SER-Open Items have been identified. Responses have been submitted.
- One Confirmatory Item identified. Will be incorporated in CCNPP Unit 3 COLA Revision 10.
- No RAI Responses pending submittal.

Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- ASLB – Atomic Safety & Licensing Board
- B&W – Babcock & Wilcox
- COL – Combined License
- COLA – Combined License Application
- DC – Design Certification
- EDF – Électricité de France
- FFD – Fitness for Duty Program
- FSAR – Final Safety Analysis Report
- IBR – Incorporate by Reference
- IRC – Independent Review Committee
- NRC – Nuclear Regulatory Commission
- OSSA – Operating Strategies for Severe Accidents Methodology
- PWROG – Pressurized Water Reactor Owner's Group
- QAPD – Quality Assurance Program Description
- RCOLA – Reference COL Application
- UNE – UniStar Nuclear Energy, LLC
- UNO – UniStar Nuclear Operating Services, LLC
- SER – Safety Evaluation Report
- SSCs – Structures, Systems and Components

Presentation to the ACRS Subcommittee

Calvert Cliffs Unit 3 Combined License Application Review
Safety Evaluation Report with Open Items

Chapter 2, Section 2.5:
"Geological, Seismology, and Geotechnical Engineering"
&
Chapter 13:
"Conduct of Operations"

May 8, 2013

Order of Presentation

United States Nuclear Regulatory Commission
Protecting People and the Environment

Chapter 2, Section 2.5

- ***Surinder Arora*** – Calvert Cliffs RCOLA Lead Project Manager
  Overview of the Project & Review Status
- ***UniStar*** – RCOL Applicant – Chapter 2, Section 2.5
  Mark Finley will introduce the UniStar Presenters
- ***Tanya Ford*** – Chapter 2 Project Manager
  Tanya will introduce the Technical Staff Presenters
- ***Technical Staff Team*** – Chapter 2, Section 2.5

Chapter 13

- ***UniStar*** – RCOL Applicant – Chapter 13
  Mark Finley will introduce the UniStar Presenters
- ***Mike Miernicki*** – Chapter 13 Project Manager
  Mike will introduce the Technical Staff Presenters
- ***Technical Staff Team*** – Chapter 13

Major Milestones Chronology

07/13/2007	Part 1 of the COL Application (Partial) submitted
12/14/2007	Part 1, Rev. 1, submitted
03/14/2008	Part 1, Rev. 2, & Part 2 of the Application submitted
06/03/2008	Part 2 of the Application accepted for review (Docketed)
08/01/2008	COLA Revision 3 submitted
03/09/2009	COLA Revision 4 submitted
06/30/2009	COLA Revision 5 submitted
07/14/2009	Review schedule published
09/30/2009	COLA Revision 6 submitted
04/12/2010	Phase 1 review completed
12/20/2010	COLA Revision 7 submitted
03/27/2012	COLA Revision 8 submitted
04/09/2013	COLA Revision 9 submitted
January 17, 2013	Phase 3 ACRS reviews complete for SER Chapters 2 (Part 1), 3 (Except 3.7), 4, 5, 6, 7, 8,10, 11,12, 14, 15, 16, 17, 18, & 19

Review Schedule (Public Milestones)

U.S.NRC
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Phase - Activity	**Target Date**
Phase 1 - Preliminary Safety Evaluation Report (SER) and Request for Additional Information (RAI)	April 2010
Phase 2 - SER with Open Items (OIs)	TBD
Phase 3 – Advisory Committee on Reactor Safeguards (ACRS) Review of SER with OIs	TBD
Phase 4 - Advanced SER with No OIs	TBD
Phase 5 - ACRS Review of Advanced SER with No OIs	TBD
Phase 6 – Final SER with No OIs	TBD

NOTE: The target dates for Phases 2 to 6 are currently being reviewed based on the latest RAI response dates.

ACRS Phase 3 Review Plan

U.S.NRC
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COMPLETION DATES FOR THE REMAINING FSAR CHAPTERS (PHASE 2 – SERs with Open Items)

Chapter	Title	Issue Date	ACRS Meeting
2 (Part 3)	Section 2.4 2.4: Hydrologic Engineering	TBD	To be scheduled
9	Auxiliary Systems	TBD	To be scheduled

A Few Words About -
The Information Incorporated by Reference

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- Several chapters of the COLA FSAR incorporate by reference the U.S. EPR Design Certification application, which is currently being reviewed under Docket No. 52-020.

  - The staff's review of the COL FSAR for the chapters or sections, which incorporate U.S. EPR FSAR by reference, ensures that the combination of the information incorporated by reference from the U.S. EPR FSAR and the information included in the COL FSAR represents the complete scope of the information relating to a specific review topic. A generic RAI 222, Question 01-5, has been issued for tracking the open item pertinent to the concurrent review of the U.S. EPR FSAR.

  - **Generic Open Item:**

    RAI 222, Question 01-5 tracks the ongoing review of the U.S. EPR FSAR as an open item for all COLA chapters. This OI will be closed after the design certification is complete.

Overview of FSAR Section 2.5 of the COLA

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SRP Section/Application Section		No. of Questions	Status Number of Open Items (OIs)
2.5.1	Basic Geologic and Seismic Information	74	5
2.5.2	Vibratory Ground Motion	26	2
2.5.3	Surface Faulting	1	0
2.5.4	Stability of Subsurface Materials and Foundations	31	1
2.5.5	Stability of Slopes	1	0
	TOTAL	**133**	**8**

Staff Review Team and Presenters

United States Nuclear Regulatory Commission
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❖ Technical Staff

- **Technical Reviewer: Dr. Alice Stieve, Geologist**
  Branch: Geoscience and Geotechnical Engineering Branch 2
  Presenting: Sections 2.5.1 and 2.5.3

- **Technical Reviewer: Dr. Dogan Seber, Sr. Geophysicist**
  Branch: Geoscience and Geotechnical Engineering Branch 1
  Presenting: Section 2.5.2

- **Technical Reviewer: Dr. Weijun Wang, Sr. Geotechnical Engineer**
  Branch: Geoscience and Geotechnical Engineering Branch 2
  Presenting: Sections 2.5.4 and 2.5.5

Section 2.5.1 – Basic Geologic and Seismic Information

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- **COL FSAR Section 2.5.1, "Basic Geologic and Seismic Information"**
  - addresses regional and site geology including stratigraphy, geologic history, tectonic setting, principle tectonic structures, and a site geologic hazard evaluation

- **COL FSAR Section 2.5.3, "Surface Faulting"**
  - includes geologic evidence to address the potential for surface deformation due to faulting (tectonic or non-tectonic) and ground subsidence due to limestone dissolution collapse

Basic Geologic and Seismic Information (cont.)

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- For Section 2.5.1, there are OIs that prevent staff from making final conclusions on 3 topics: Stafford fault, National Zoo faults, and Central Virginia Seismic Zone (CVSZ). Otherwise, staff finds that:
  - the geologic characteristics of the site region will not affect the design and operation of the proposed unit.
  - the geologic characteristics of the site region are in support of the SSE evaluations in Section 2.5.2 and the surface deformation evaluation in Section 2.5.3.
- For Section 2.5.3, staff finds that the potential for surface tectonic and nontectonic deformation is negligible or non-existent, per 100.23(d)(2), within the site vicinity.

Basic Geologic and Seismic Information (cont.)

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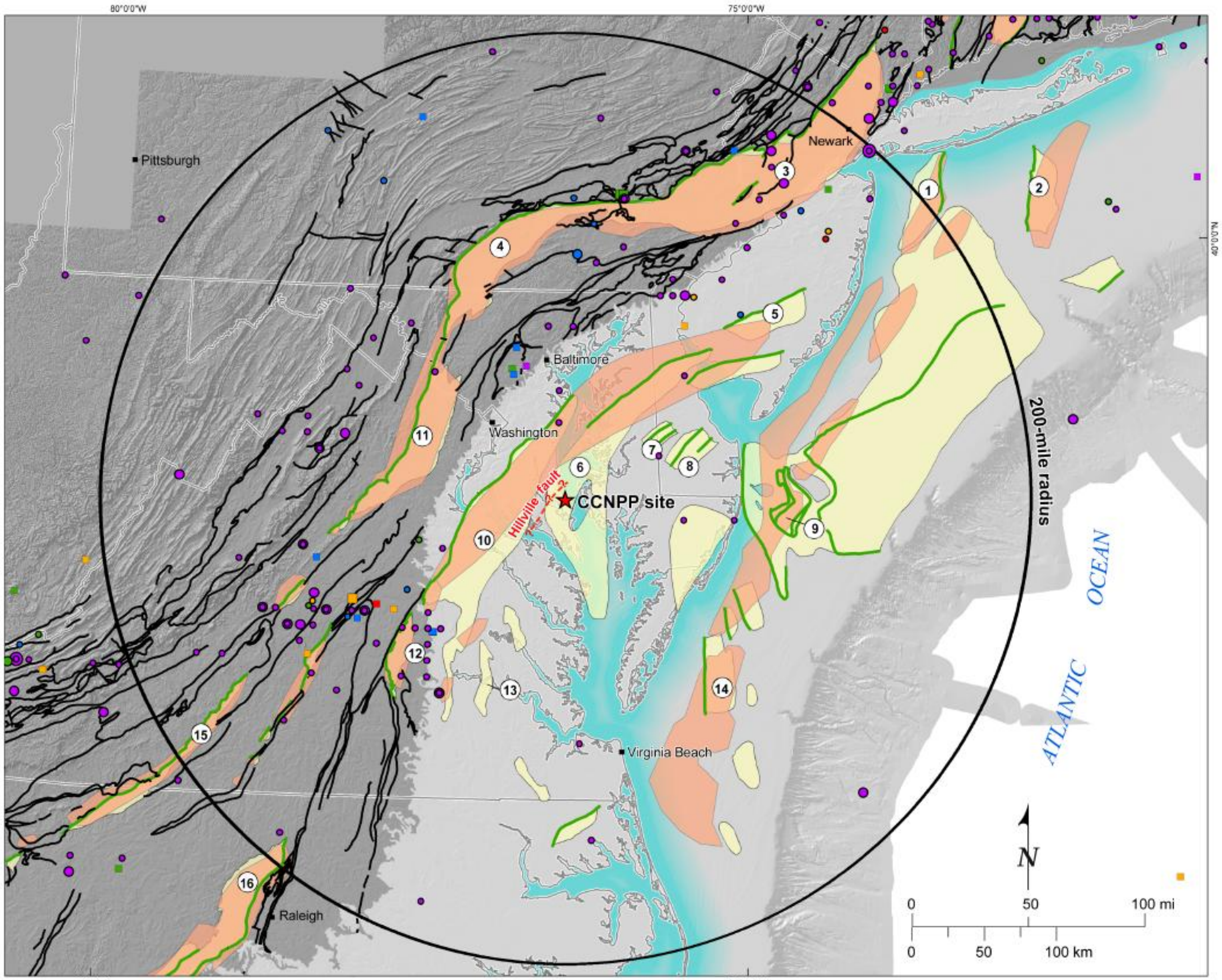
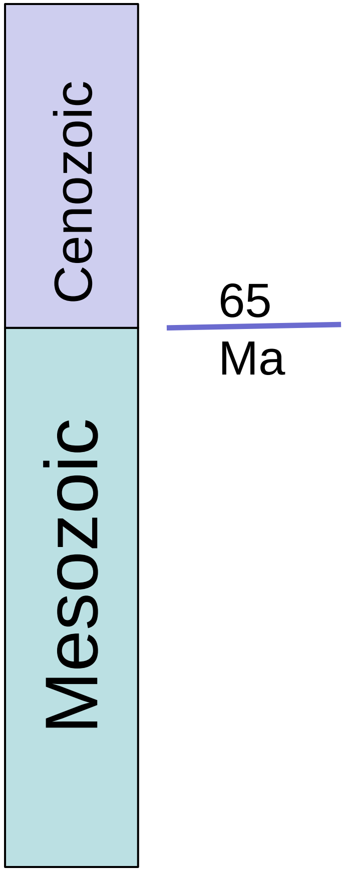
- Primary topic of interest for the staff's review was the characterization information pertaining to alleged or geologically young faults in the site vicinity (4).

- No massive limestone in the stratigraphic section, therefore no dissolution hazard for the assessment of potential surface deformation (tectonic and nontectonic) at the site.

Mesozoic Basins





Basic Geologic and Seismic Information (cont.)

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- Inferred fault at Moran Landing, ~1 mile south of the CCNPP site (Kidwell,1997)
- Hillville fault, within 5 mi of site (Hansen,1986)
- Interpreted 3 Monoclines, within 2-10 mi (McCarten et al, 1995)
- Inferred fault in the north Chesapeake Bay, beyond 25 mi site vicinity (Pazzaglia,1993)

Basic Geologic and Seismic Information (cont.)

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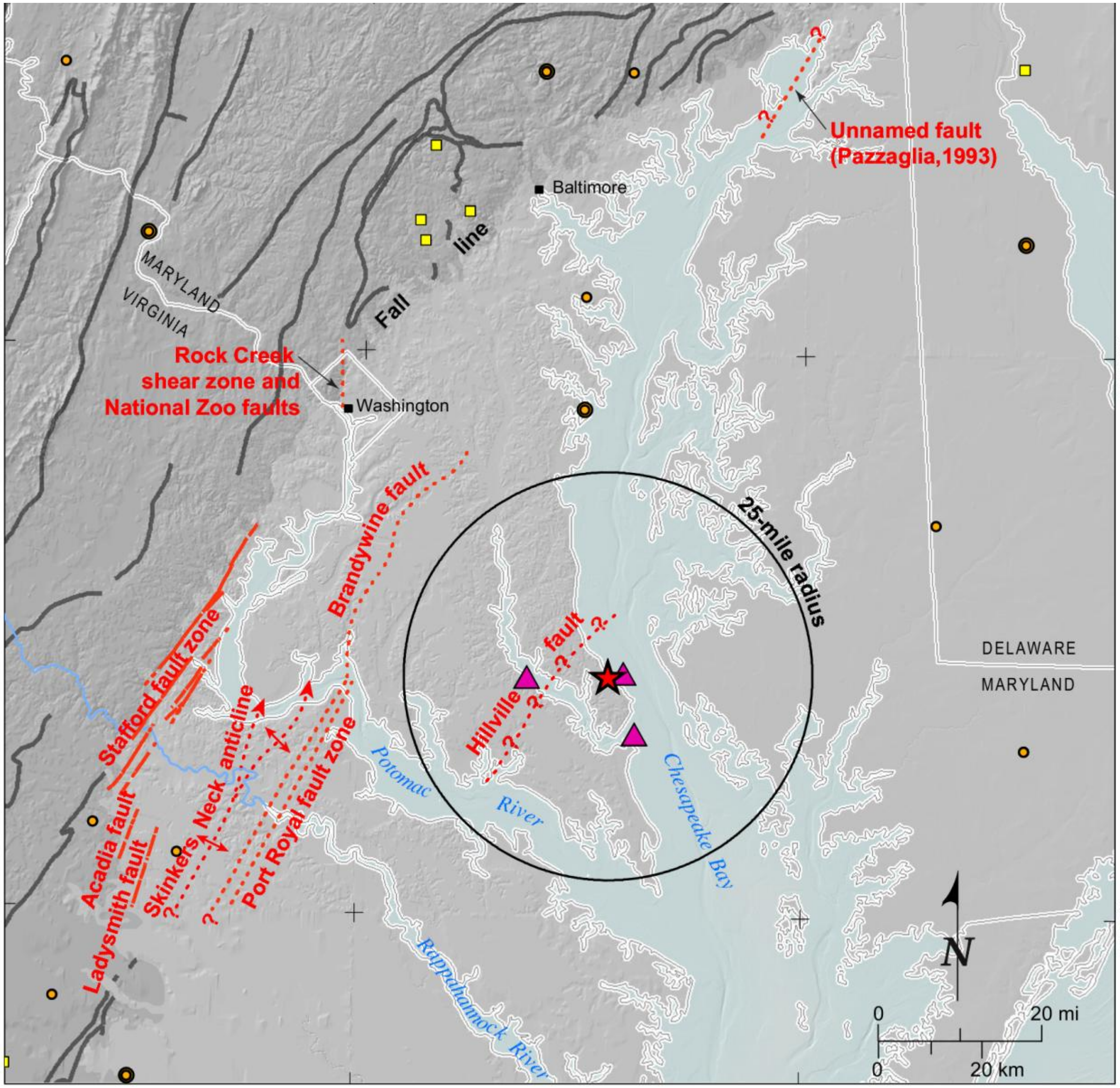
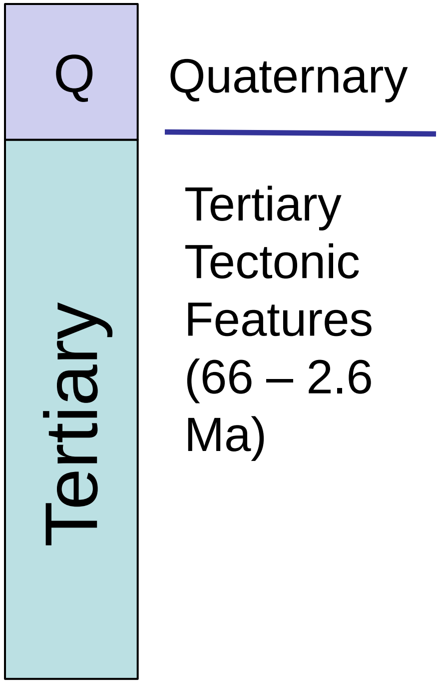
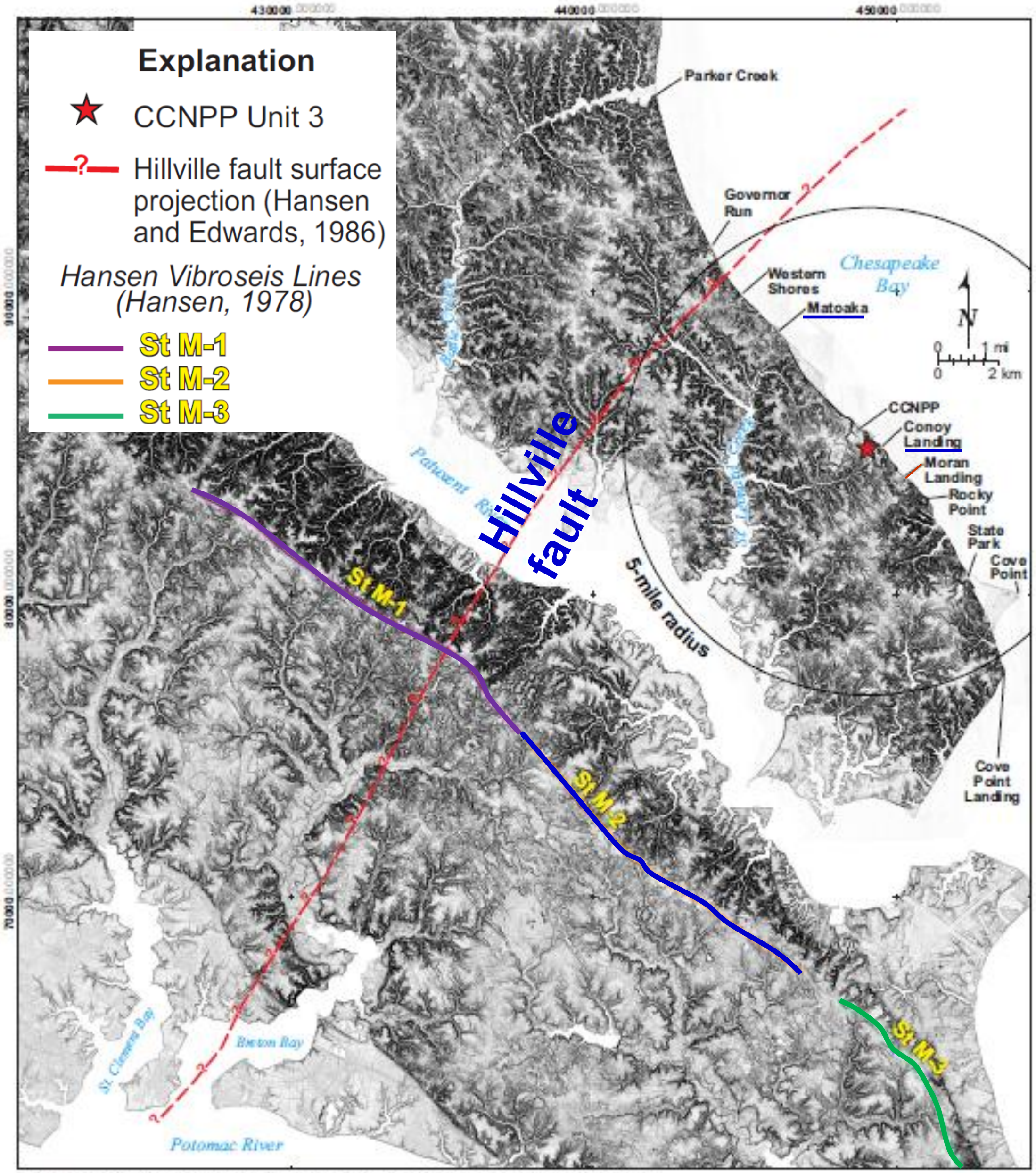
- The staff also considered the following in its review:
  - Geologic statements submitted as contention by interested persons (not admitted)
  - New geologic information emerging in CVSZ, >100 miles from CCNPP site

Basic Geologic and Seismic Information (cont.)







Note: LiDAR data for Calvert and St. Mary's County has a resolution of 2 meters.

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Hillville fault
5 mi radius
Seismic reflection line
LiDAR base map

Moran Landing (view North)

Fluvial deposits

Erosional contact

Marine formations

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Local Stratigraphy

ERA	PERIOD	EPOCH	AGE (Ma)	UNIT	THICKNESS (FT)
Cenozoic	Quarter-nary	Holocene	0.01	Alluvium & Beach Deposits	0-50
		Pleistocene	1.8	Terrace & Lowland Deposits	
	Tertiary	Pliocene	5.3	Upland Deposits	0-50
		Miocene Upper	11.2		
		Miocene Middle	16.4	Chesapeake Group St. Marys Formation Choptank Formation Calvert Formation	245-280
		Eocene Middle	49	Piney Point Formation	20
		Eocene Lower	54.8	Nanjemoy Formation	180
		Paleocene Upper	61	Marlboro Clay Aquia Formation	165-170
		Paleocene Lower	65	Brightseat Formation	10-20
Mesozoic	Cretaceous	Upper	99	Magothy, Monmouth, Matawan Formations undifferentiated	30?
		Lower	144	Potomac Group Patapsco Formation Arundel/Patuxent Formations (undivided)	1000-1100 750-900
Proterozoic/ Paleozoic			543+	Metamorphic/Igneous	

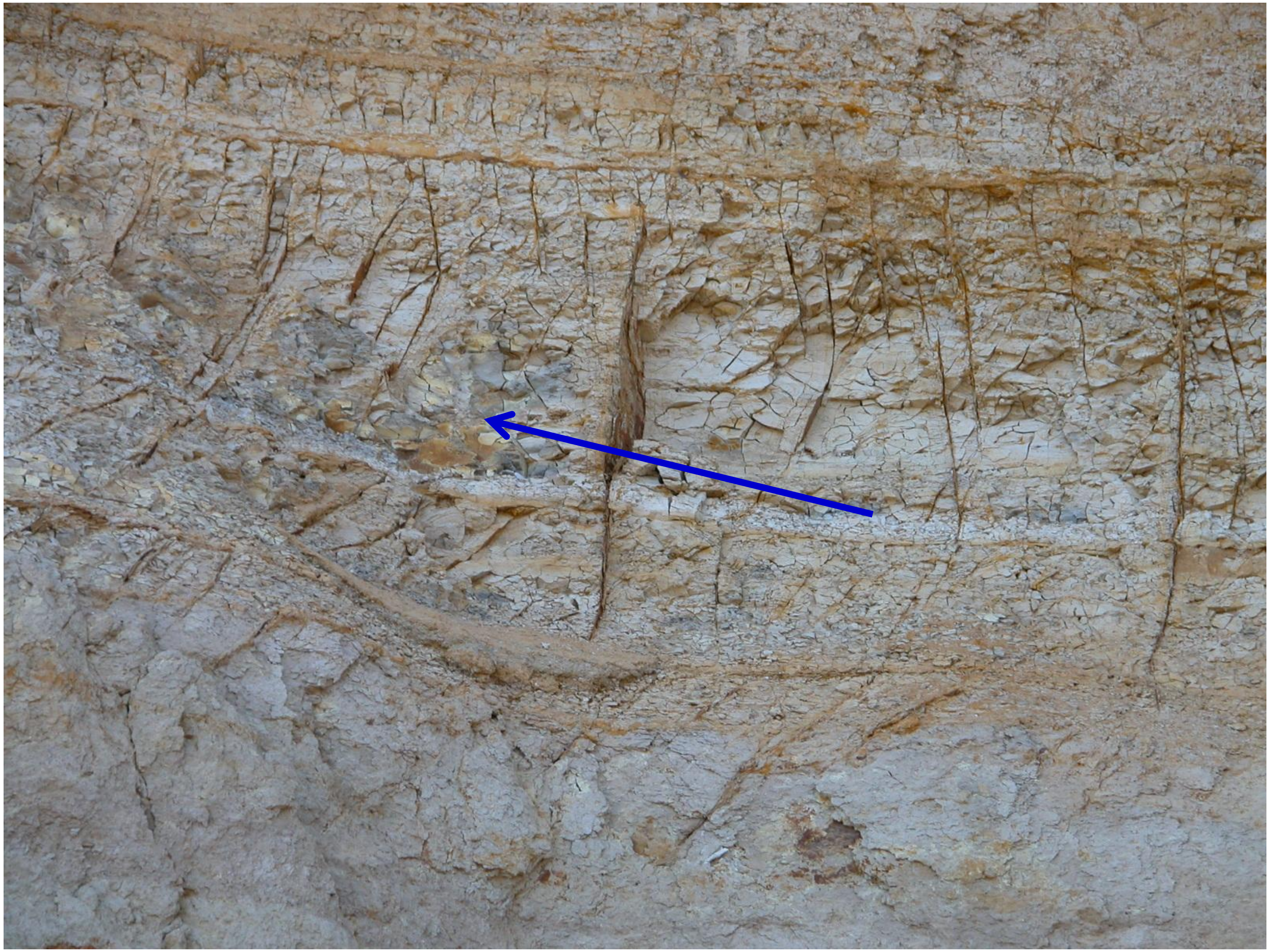
Erosional contact

Calvert Cliffs near the CCNPP site

Possible upward penetration of Hillville fault

CP/Basement contact @ ~2600 ft

Joints Perpendicular to Calvert Cliffs



Hillville Fault at Crystalline Basement Contact

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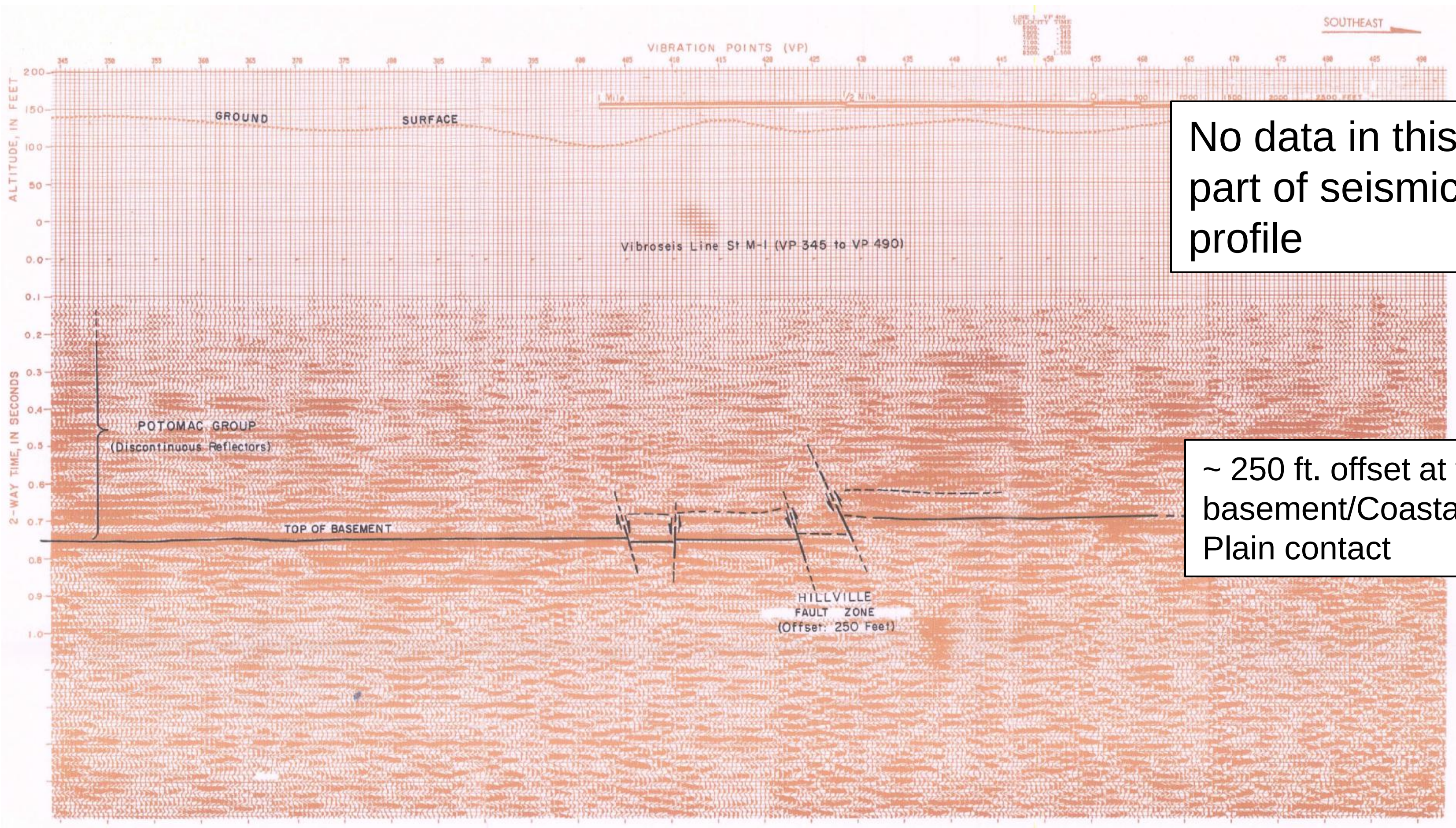

No data in this part of seismic profile

~ 250 ft. offset at the basement/Coastal Plain contact

Monoclines

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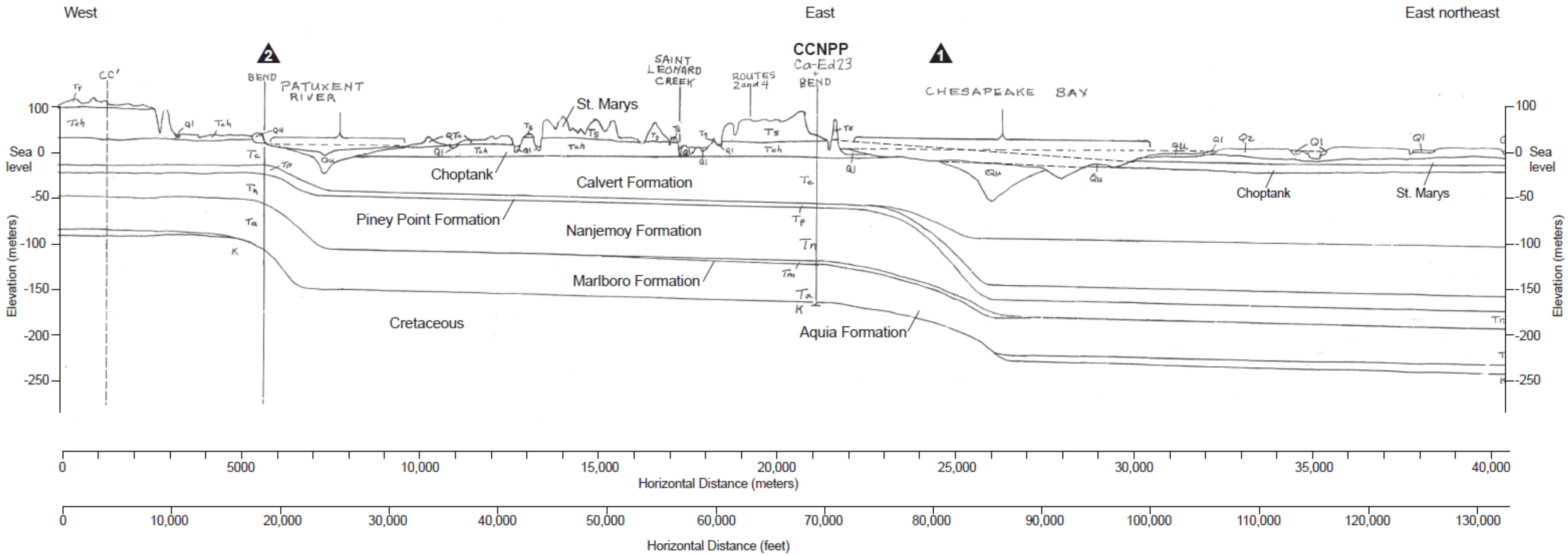

Explanation

Location of inferred warp shown on Figure 2.5-25; vertical exaggeration = ~25X

Note: The above portion of section A - A' was modified from McCartan et al. (1995).

Calvert Cliffs at Moran Landing

NRC Staff (and Contractors) and Calvert Cliffs' Applicant and Contractors

Fossils in Sandy Choptank Formation

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Section 2.5.2 – Vibratory Ground Motion

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- COL FSAR review is based on the FSAR markups to Revision 8 submitted by the applicant on September 27, 2012, in response to RAIs 284, 322, and 345
- COL FSAR Section 2.5.2 addresses two COL Information Items:
  - Site-specific details on seismic, geophysical and geotechnical information to determine Safe Shutdown Earthquake (SSE)
  - Site-specific seismic response spectra and comparison with the Certified Seismic Design Response Spectra (CSDRS)
- COL application review included the following:
  - Confirming the COL Information Items specified in the U.S. EPR FSAR are addressed
  - Determining whether the COL FSAR provided sufficient information and adequately evaluated the potential seismic hazard at the site and established an adequate seismic response spectra

Review Topics of Interest

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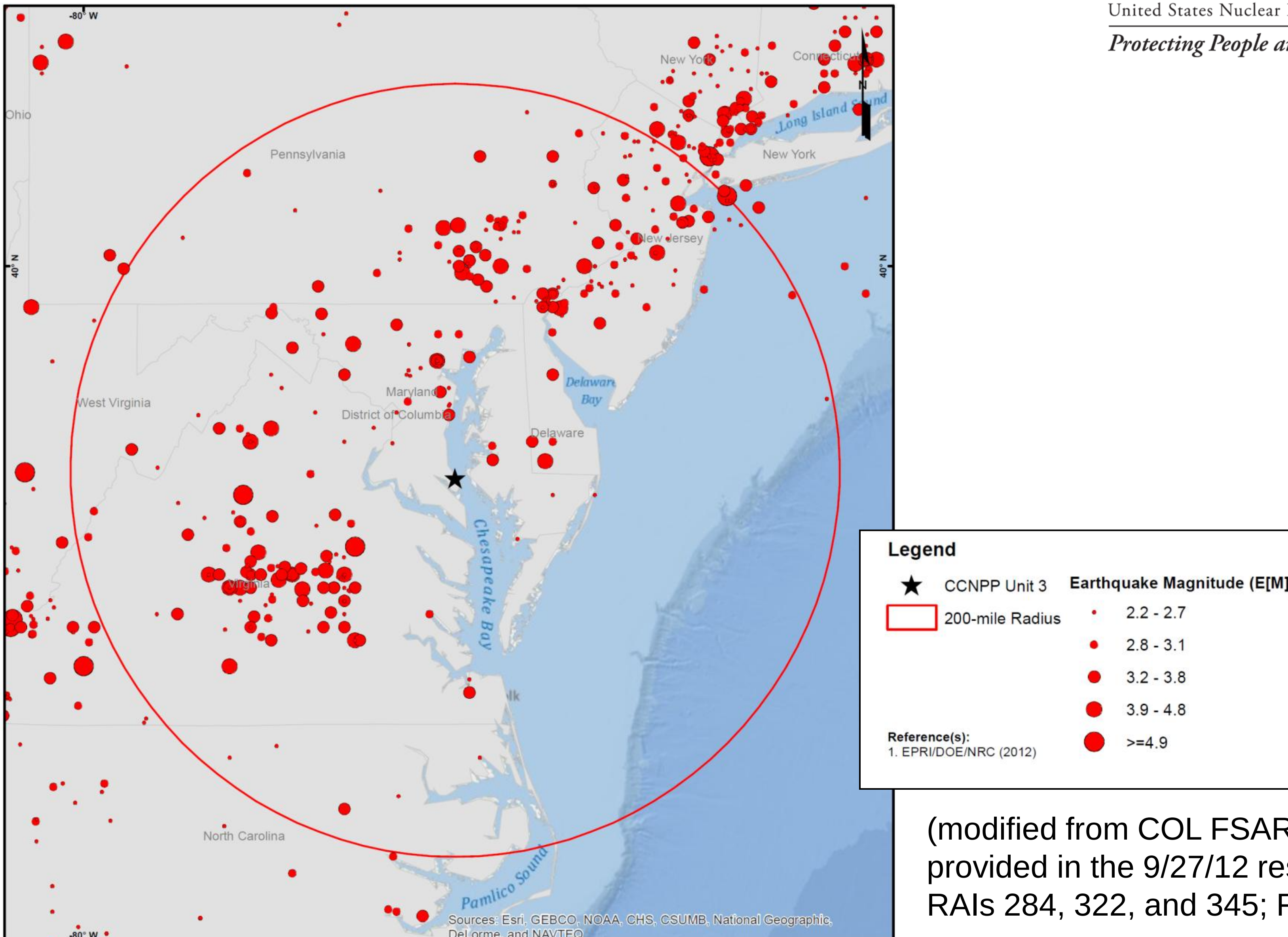
- Original COL FSAR submitted in 2008 used the EPRI-SOG seismic source models
- Following the Fukushima NTTF recommendations and the publication of new seismic source models in NUREG-2115 in January 2012, the applicant changed its base seismic model and used the NUREG-2115 model
- This change in base seismic models resulted in an almost complete re-review of COL FSAR Section 2.5.2
- Many original RAIs became irrelevant, while a few others were added
- Currently, there are two Open Items related to Probabilistic Seismic Hazard Assessment (PSHA) calculations

Seismicity and Updates



(modified from COL FSAR markups provided in the 9/27/12 response to RAIs 284, 322, and 345; Figure 2.5-46)

Seismicity Updates

- NUREG-2115 Seismic Source Characterization (SSC) model includes an earthquake catalog complete through 2008
- The staff developed an update to this catalog covering additional years from 2009 through 2012 to evaluate any potential impacts of new earthquakes since 2008 on the PSHA calculations
- 413 earthquakes were identified with magnitudes equal to or greater than 3.0. Five of these earthquakes had magnitudes of 5.0 or greater

Seismicity Updates

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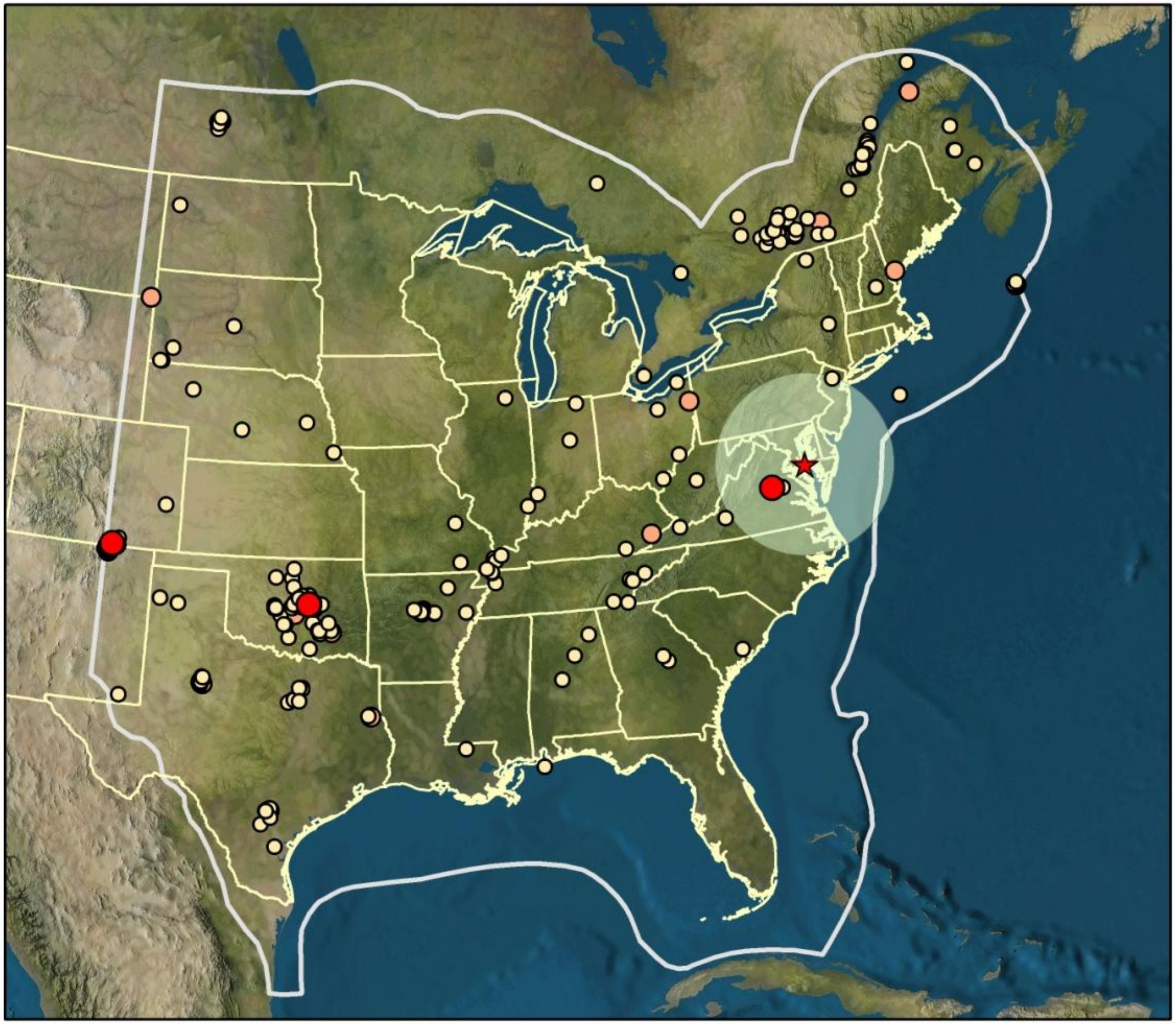

CEUS earthquakes since 2008

- 5.0 - 6.0
- 4.0 - 5.0
- 3.0 - 4.0
- CCNPP Unit 3
- CCNPP 200 Mile Radius
- CEUS study area

Mineral, VA Earthquake of August 23, 2011 (M5.7)

- Mineral, VA earthquake is the most significant earthquake in the updated catalog
- In response to an RAI, the applicant indicated that this earthquake impacts both the M_{max} definitions of some of the seismic sources and the seismicity rates published in NUREG-2115
  - M_{max} changes were minor without any impacts on the PSHA results
  - Rate changes impact the hazard calculations up to about 13% at the CCNPP site

Open Item 2.5.2-1: Impact of the Mineral, VA on the CCNPP3 PSHA Results

- In RAI 385, Question 02.05.02-26, the staff requested further information on the sensitivity study conducted to analyze the impact of the Mineral, VA earthquake on the seismicity rate increases. The staff received the study details on April 22, 2013, but has not been able to review and confirm the full impacts of the Mineral, VA earthquake on CCNPP Unit 3 PSHA results. This issue is being tracked as an open item.

PSHA Evaluation

- In August 2012, the staff conducted an audit of the seismic software used in seismic hazard calculations
- Purpose of the audit was to review seismic hazard software and examine the implementation of the new seismic source model described in NUREG- 2115
- The staff did not identify any significant issues. However, the applicant did not have comparative calculations at the seven test sites provided in NUREG-2115

PSHA Evaluation (cont.)

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- **Open Item 02.05.02-2 – Confirmation of full PSHA results:**
  - In RAI 381,Question 2.5.2-25 the staff requested hazard contributions of individual seismic sources to conduct an independent confirmatory study. The staff has not finalized its confirmatory study and the issue is being tracked as an open item.

Site Response Evaluation

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- Staff conducted confirmatory site response calculations using the same input parameters used by the applicant
- Alternative calculations conducted using differing model parameters to investigate potential impacts of parameter uncertainty in the calculations
- The staff's confirmatory results are within acceptable uncertainty limits

Site Response Evaluation

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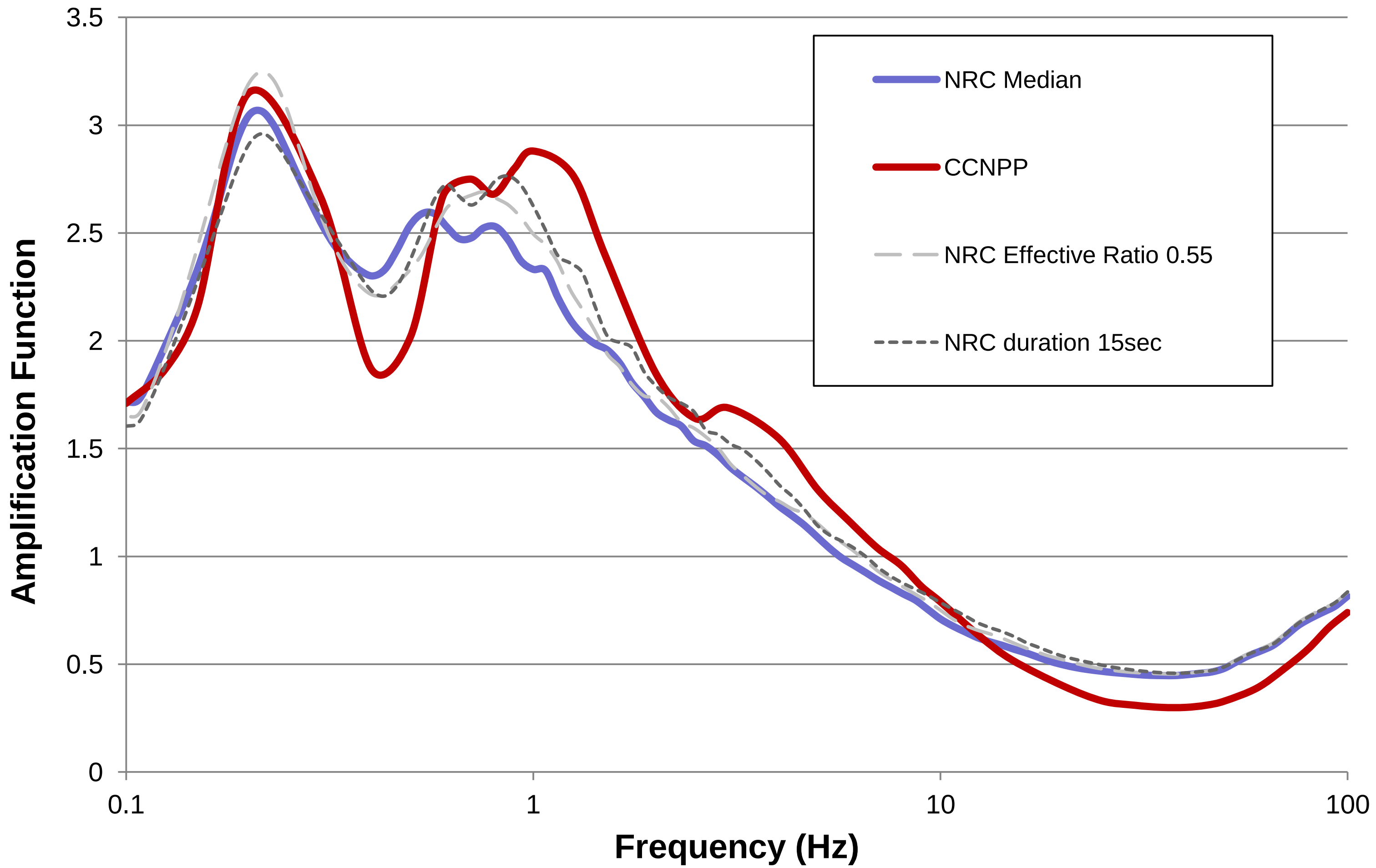
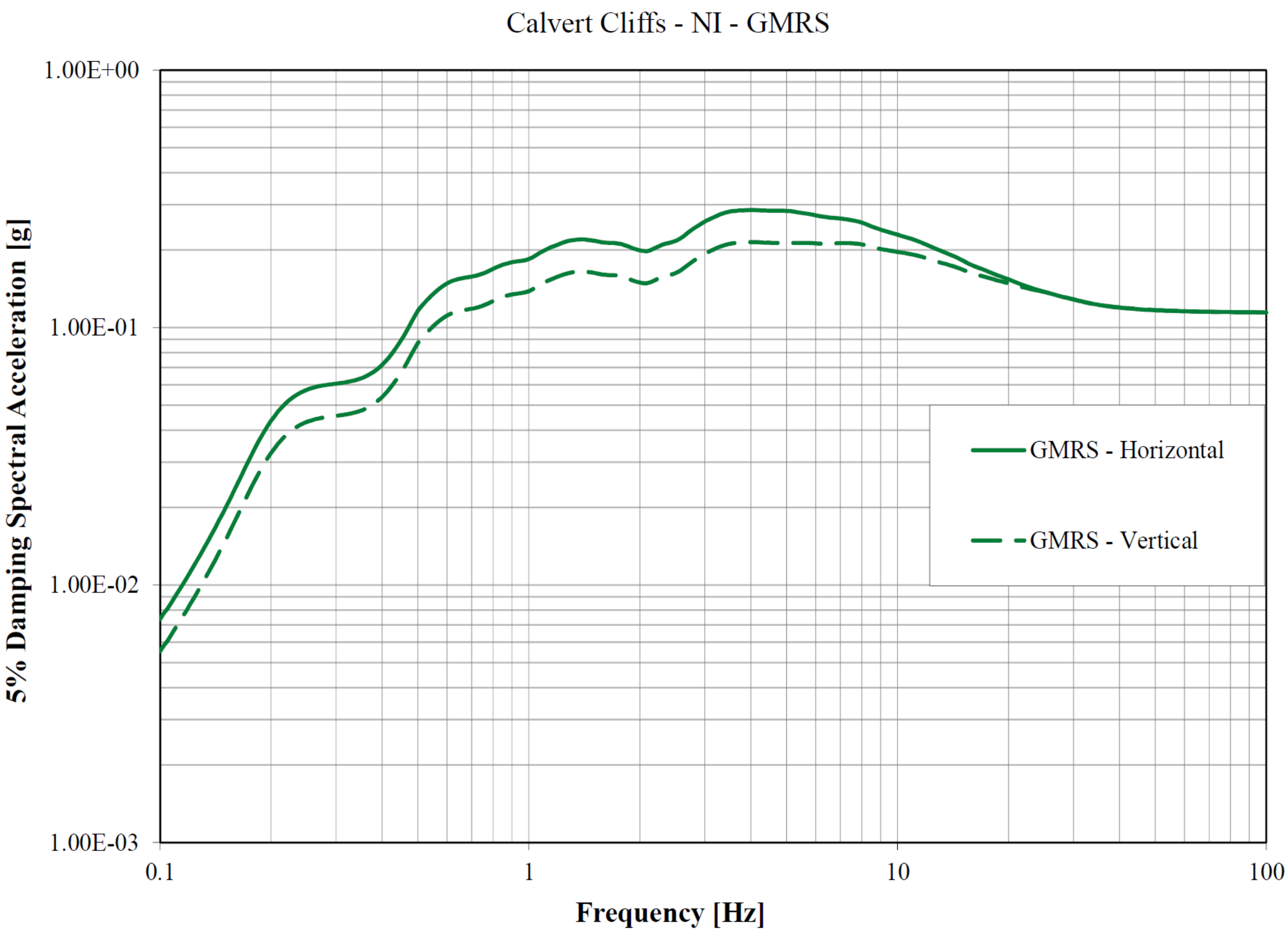


CCNPP Unit 3 Ground Motion Response Spectra (GMRS)



(from COL FSAR markups provided in the 9/27/12 response to RAIs 284, 322, and 345; Figure 2.5-87)

Section 2.5.4 – Stability of Subsurface Materials and Foundations

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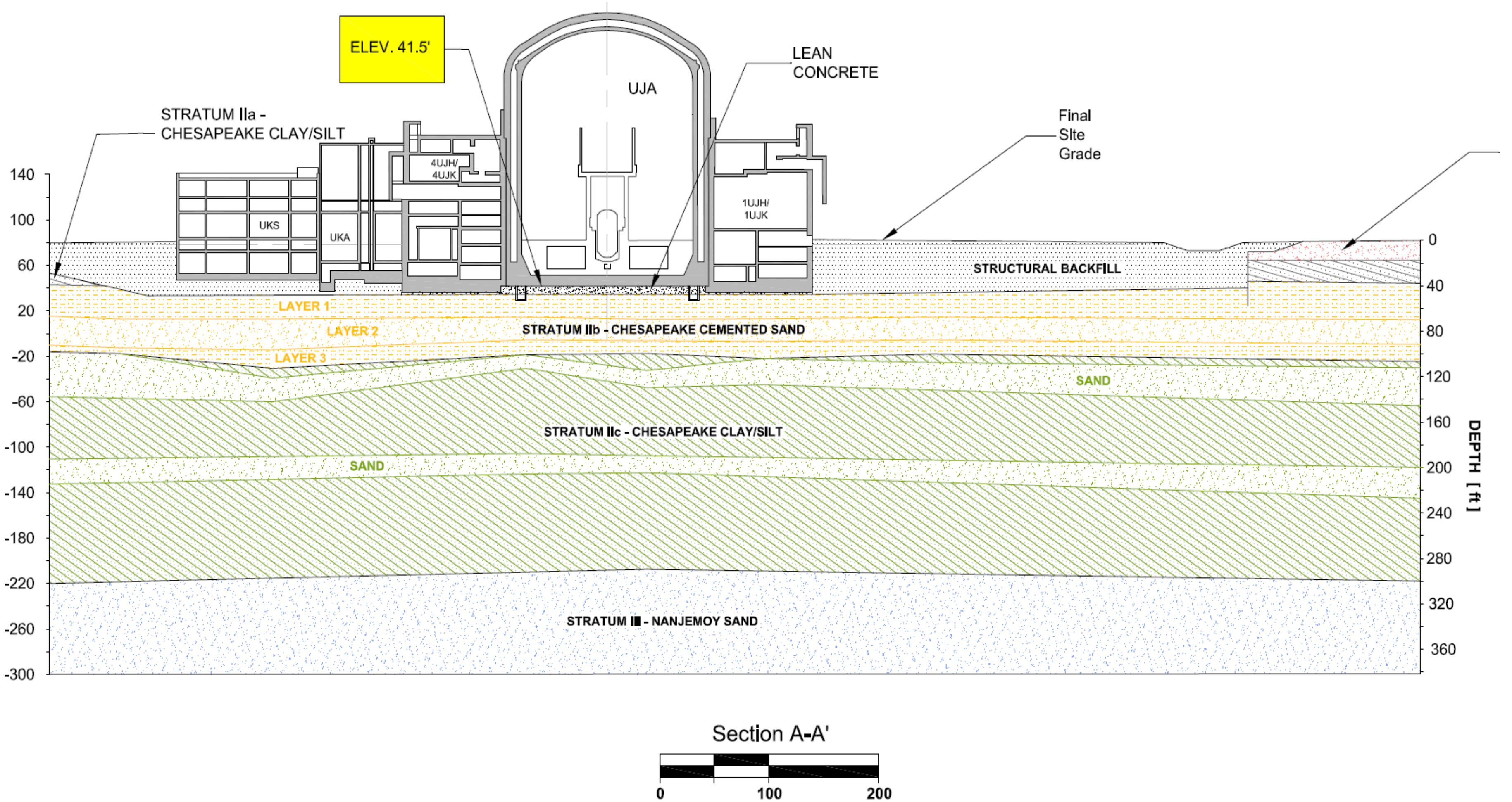
CCNPP Unit 3 COL Application Review

- COL application includes site-specific information on the following:
  - FSAR Section 2.5.4.2 Properties of Subsurface Materials
  - FSAR Section 2.5.4.3 Foundation Interfaces
  - FSAR Section 2.5.4.4 Geophysical Surveys
  - FSAR Section 2.5.4.5 Excavation and Backfill
  - FSAR Section 2.5.4.6 Groundwater Conditions
  - FSAR Section 2.5.4.7 Response of Soil and Rock to Dynamic Loading
  - FSAR Section 2.5.4.8 Liquefaction Potential
  - FSAR Section 2.5.4.10 Static Stability
- COL FSAR Section 2.5.4 addresses 6 COL information items
- Section 2.5.4 contains two departures from the U.S. EPR FSAR with exemption requests on minimum shear wave velocity and differential settlement design requirements
- COL application review included:
  - Confirming all COL information items specified in the U.S. EPR FSAR are addressed
  - Determining whether the COL FSAR provided sufficient information and adequately evaluated the stability of subsurface materials and foundations in compliance with the regulations

Summary of FSAR Section 2.5.4

1. Determined material and engineering properties of subsurface materials based on field and laboratory test results
2. Identified the load bearing layer and described foundation interface
3. Provided detailed information on excavation and backfill, including the extent of excavation, source and quantity of backfills, compaction specification, in-place backfill properties and related ITAAC
4. Provided liquefaction potential evaluation to ensure there is no liquefaction potential at this site

Foundation and Supporting Subsurface Soils



Summary of FSAR Section 2.5.4 (cont.)

5. Estimated soil bearing capacity using different models and chose the most conservative result for design.
6. Estimated total and differential settlements of the foundations using 3D Finite Element Method (FEM)
7. Discussed the uniformity of the subsurface materials and accounted for the variability of soil properties in stability analyses
8. Calculated lateral earth pressure on the foundation structures to ensure that it meets standard design requirement

Evaluation Results

The staff concludes that:

- The applicant has performed an adequate subsurface exploration.
- The soil properties used in the design and analyses are determined based on field and laboratory test results with consideration of the variability of soil properties, which reasonably represent the site conditions.
- The bearing capacity of the supporting soils and the settlement of foundations under the static and dynamic loading conditions are evaluated using adequate conventional and state-of-the-art methods (OI remains).
- Appropriate factors of safety are used in stability analyses with conservative approaches in evaluation procedures.

COL Departures

- **Departure #1:**
  - ♦ The shear wave velocity (SWV) of in-situ material below Category I structure buildings after backfill placement is less than 1,000 fps as required in the U.S. EPR FSAR

    Evaluation: The applicant performed confirmatory analyses and sensitivity study using site-specific SWV values (628 and 688 fps) for backfill soil in seismic response and SSI analyses. The results showed that GMRS and foundation input response spectra (FIRS) based on the original seismic hazard calculation were bounded by the standard design response spectra. However, since the site seismic sources has been updated, the staff cannot finalize its conclusion before reevaluating this departure based on updated GMRS and FIRS.

COL Departures (cont.)

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- **Departure #2:**
  - The estimated tilt settlements for ESWB 1&2 and EPGB 1 do not meet the U.S. EPR FSAR requirement of ½ inch per 50 ft (or 1/1200)

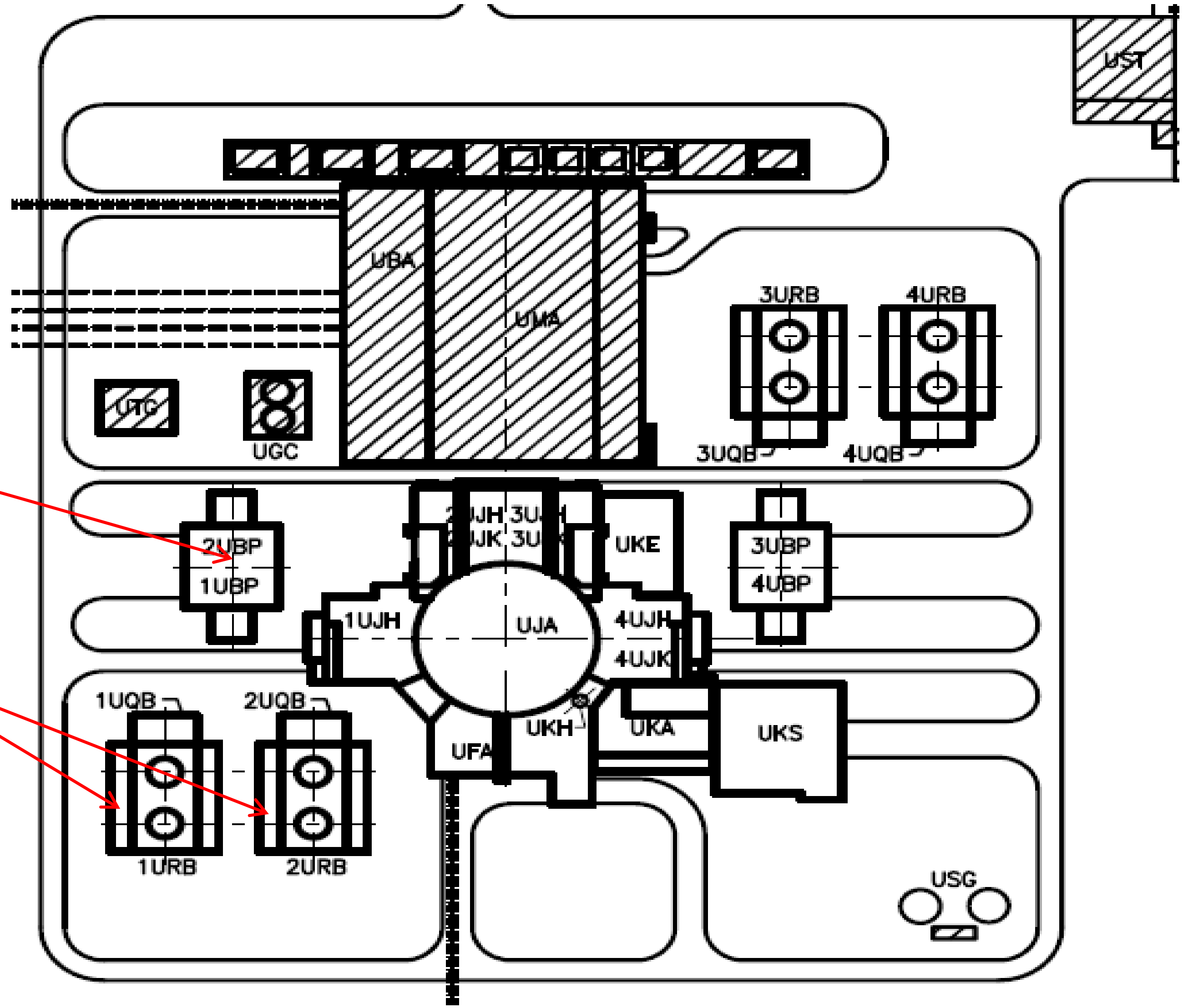
    Justification: The applicant performed site-specific FEM analyses using a more realistic foundation model: a six-foot concrete basemat as designed, while the conventional method treated the foundation as a flexible plate, which is much more conservative. The FEM analyses predicted the maximum differential settlement within the confines of the entire structure foundation basemat is 1/1417 for the ESWBs, and 1/2714 for EPGBs - less than the allowable value of the U.S. EPR FSAR. The applicant proposed engineering measures for control of foundation differential settlements

    Evaluation: This departure will not adversely affect the stability of foundations and structures. (Detailed evaluation in Section 3.8.5)

Plant Layout

EPGB 1&2

ESWB 1&2



Open Item

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- **Open Item 02.05.04.-1: Lack of specific inspections, tests, analyses and acceptance criteria (ITAAC) on settlement control**
  - Settlement is an important stability concern at any deep soil site and a large settlement is expected at the CCNPP Unit 3 site.
  - Uncertainties related to the properties of subsurface materials, the models used in analyses and construction practices greatly affect the accuracy of settlement evaluation.
  - Different analysis methods yielded a wide range of settlement predictions and no currently available model can perfectly predict the settlement that will actually occur in the field.
  - Although the COL applicant provided a detailed settlement monitoring program, there is no specific ITAAC on settlement control to ensure that the design settlement requirements will be met when structures are actually built.
  - The staff issued an RAI asking for a solution to resolve this open item.

Potential Open Item

- **Bearing capacity reconciliation with revised U.S. EPR design requirement**
  - Currently revised U.S. EPR FSAR (Revision 4) changed the static bearing capacity design parameter and the estimated bearing capacity for the CCNPP Unit 3 site will not satisfy the revised design requirement
  - The applicant is evaluating options to meet the value in the U.S. EPR FSAR or determine if a departure is needed

Section 2.5.5 – Stability of Slopes

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CCNPP Unit 3 COL Application Review

- COL application includes site-specific information on the following:
  - FSAR Section 2.5.5.1 Slope Characteristics
  - FSAR Section 2.5.5.2 Design Criteria and Analysis
- COL FSAR Sections 2.5.5 addresses one COL information item and there is no departure from the U.S. EPR FSAR
- COL application review included:
  - Confirming all COL information items specified in the U.S. EPR FSAR are addressed
  - Determining whether the COL FSAR provided sufficient information and adequately evaluated the stability of man-made and natural slopes, of which failure could adversely affect the safety of the plant
- **Evaluation Results**
  - There are no outstanding issues regarding slope stability for this site.
  - The staff concludes that the information provided is sufficient and the design analyses contain adequate margins of safety for stability of slopes at the site, which meet the requirements of 10 CFR Parts 52 and 100.

Acronyms

U.S.NRC
United States Nuclear Regulatory Commission
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ACRS	Advisory Committee on Reactor Safeguards	**NI**	Nuclear Island
CCNPP3	Calvert Cliffs Nuclear Power Plant, Unit 3	**NRC**	Nuclear Regulatory Commission
CEUS	Central Eastern United States	**NTTF**	Near Term Task Force
COL	Combined License	**OI**	Open Item
COLA	Combined License Application	**PSHA**	Probabilistic Seismic Hazard Assessment
CP	Coastal Plain	**RAI**	Request for Additional Information
CSDRS	Certified Seismic Design Response Spectra	**RCOL**	Reference Combined License
CVSZ	Central Virginia Seismic Zone	**RCOLA**	Reference Combined License Application
EPGB	Emergency Power Generating Building	**SER**	Safety Evaluation Report
EPRI-SOG	Electric Power Research Institute – Seismicity Owners Group	**SRP**	Standard Review Plan
ESWB	Essential Service Water Building	**SSC**	Seismic Source Characterization
FEM	Finite Element Method	**SSE**	Safe Shutdown Earthquake
FIRS	Foundation Input Response Spectra	**SSI**	Soil Structure Interaction
FSAR	Final Safety Evaluation Report	**SWV**	Shear Wave Velocity
GMRS	Ground Motion Response Spectra	**TBD**	To Be Determined
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria		

Presentation to the ACRS Subcommittee

Calvert Cliffs Unit 3 Combined License Application Review

Safety Evaluation Report with Open Items

Chapter 13: Conduct of Operations

May 8-9, 2013

Staff Review Team

- **Technical Staff**
  - **Tech Reviewer: Mark Lintz**
    Branch Name: Operator Licensing and Human Performance
  - **Tech Reviewer: Jim Kellum**
    Branch Name: Operator Licensing and Human Performance
  - **Tech Reviewer: Rick Pelton**
    Branch Name: Operator Licensing and Human Performance
  - **Tech Reviewer: Dan Barss**
    Branch Name: New Reactor Licensing Branch
  - **Tech Reviewer: Pete Lee**
    Branch Name: Reactor Security Licensing

Staff Review Team

- **Technical Staff**
  - **Tech Reviewer: David Diec**
    Branch Name: Security Programs Support
  - **Tech Reviewer: Monika Coflin**
    Branch Name: Cyber Security and Integrated Response

- **Project Managers:**
  - **Lead PM: Surinder Arora**
  - **Chapter PM: Michael Miernicki**

Overview of COLA – Chapter 13

U.S.NRC
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SRP Section/Application Section		No. of Questions	Status Number of OI
13.1	Organizational Structure of Applicant	1	0
13.2	Training	1	0
13.3	Emergency Planning	58	6
13.4	Operational Program Implementation	1	0
13.5	Plant Procedures	0	0
13.6	Security	109	0
13.7	Fitness for Duty	4	0
13.8	Cyber Security	4	0
Totals		178	6

Technical Topics of Interest
13.3 Emergency Planning

Items of Interest

- Reference COLA for EPR Design Center
- Co-located licensee requirements (10 CFR 50, Appendix E, IV.F.2.c)

Staff Evaluation

- Staff compared the Applicant's submittal with the requirements in 10 CFR 50.47 and Appendix E to Part 50 and implementing guidance
- Six Open Items; under review
- Fukushima NTTF Recommendation 9.3 response received February 25, 2013; under review
- Applicant's revised emergency plan to address EP rule enhancements received April 30, 2013; under review

Description of Open Items

- RAI 372, Question No. 13.03-52: Inconsistent discussion of impediments to developing Emergency Plans
- RAI 372, Question No. 13.03-53: On-Shift Staff's ability to provide EP functions and major tasks
- RAI 372, Question No. 13.03-54: Emergency Action Level (EAL) design specific deviations
- RAI 372, Question No. 13.03-55: Alert Notification System (use of methods other than fixed sirens)
- RAI 372, Question No. 13.03-56: Central Location for sample collection and analysis
- RAI 372, Question No. 13.03-57: Dose Assessment Model reflects the CCNPP Unit 3 site characteristics

Conclusion

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- Except for the open items listed above, the staff concludes that the program areas discussed in FSAR Chapter 13 of the CCNPP Unit 3 COLA are acceptable and in accordance with applicable regulations

Questions ?

ACRONYMS

United States Nuclear Regulatory Commission
Protecting People and the Environment

- CCNPP - Calvert Cliffs Nuclear Power Plant
- CFR -Code of Federal Regulations
- COLA - Combined License Application
- EAL - Emergency Action Level
- EP - Emergency Preparedness
- FSAR - Final Safety Analysis Report
- ITAAC - Inspections, Tests, Analyses, and Acceptance Criteria
- NTTF - Near Term Task Force
- OI - Open Item
- PM - Project Manager
- SRP- Standard Review Plan