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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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EARLY SITE PERMITS SUBCOMMITTEE

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MEETING

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WEDNESDAY,

OCTOBER 24, 2007

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The meeting was convened in Room T-2B3, 11545 Rockville Pike, Rockville, Maryland, at 8:30 a.m., DANA A. POWERS, Chair, presiding.

MEMBERS PRESENT:

DANA A. POWERS, Chair

J. SAM ARMIJO

OTTO MAYNARD

WILLIAM J. SHACK

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(8:35 a.m.)

I. INTRODUCTION

CHAIRMAN POWERS: The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards Subcommittee on Early Site Permits. I am Dana Powers, Chairman of the Subcommittee. Members in attendance are Sam Armijo, Otto Maynard, and William Shack.

The purpose of the meeting is to review and discuss the applications submitted by Southern Nuclear Operating Company for the Vogtle early site permit and the associated NRC staff draft safety evaluation report with open items.

The Committee must review the application and the staff safety evaluation to fulfill the requirements at 10 CFR Part 52.23 that the ACRS report on those portions of an early site permit application that concern safety.

The Subcommittee will also discuss with the NRC staff the efficiency and the effectiveness of the staff's implementation of lessons learned from its review activities performed pursuant to 10 CFR Part 52.

The Subcommittee will hear presentations by and hold discussions with representatives of the NRC staff, Southern Nuclear Operating Company, and other interested persons regarding this matter.

The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate for deliberation by the full Committee. And in the course of today's presentation, we will decide what has to be presented to the full Committee, which is distinctly very much a subset of what we will go over today.

We will give you some head's up on what that is. Roughly the Committee will block out about two hours for both your presentation, the staff's presentation, and their deliberation from this matter. So we will compact it substantially.

Mr. David Fischer is the designated federal official for this meeting. The rules for participation in today's meeting have been announced as part of a notice for this meeting previously published in the Federal Register on September 26th, 2007.

I'm sure everybody looked at that closely and diligently to know exactly what those rules are.

Should you not have, Mr. Fischer will remind you, right?

MR. FISCHER: Yes, sir.

CHAIRMAN POWERS: A transcript of the meeting is being kept and will be made available, as stated in the Federal Register notice, as requested. Would speakers first identify themselves and speak with sufficient clarity and volume so they can be readily heard?

This is a Subcommittee meeting. And we are very much in the business of gathering information. So those who want to make comments, please just come to one of the microphones around the room. And just state your name to begin with so that the young lady over here keeping the transcript can properly designate who you are. And I encourage you to do so.

The Subcommittee meetings are much more informal than full Committee meetings. And so we can tolerate discussion and encourage it. It's very important that the Subcommittee get a proper perspective on this in developing its draft positions.

We have received no written comments or requests for time to make oral statements from any

members of the public regarding today's meeting.

I would say to the members, I remind you we are actually doing two subjects today. We have two letters to draft for the Commission's consideration or two letters to at least consider drafting for the Commission's consideration.

One deals specifically with this early site permit and the SER. The other deals with what the staff has done on the lessons learned. Of course, Southern Nuclear is not at all responsible for that aspect. They're victims of it, not participants in it.

On the other hand, Southern Company representatives, if you have thoughts in the area of lessons learned, having gone through this early site permit, gee, we would sure welcome hearing about them.

We're looking for efficiency and effectiveness. We are particularly interested in thoughts you might have on the emergency planning. That has been a source of difficulty for us in the early site permits and whatnot. So if you have thoughts, don't hesitate. Don't keep them to yourself.

Copies of the meeting, agenda, and

handouts are available in the back of the meeting room. I think we are now in a position to proceed with the meeting unless members have opening comments they would care to make.

(No response.)

CHAIRMAN POWERS: Seeing none, I will turn first, Ted, are you going to lead us off or -- Chuck, are you going to lead us off?

MR. PIERCE: Right. I'm going to start.

II. SOUTHERN NUCLEAR OPERATING COMPANY

MR. PIERCE: My name is Chuck Pierce. And I am the licensing manager for the Vogtle deployment group at Southern Nuclear, which basically means I'm responsible for the licensing for the Vogtle III and IV activities.

I first want to apologize. We actually were supposed to have 35 copies today. We have 15 right now. We have more being made. They will be here shortly. So we will have some more copies for you for people who don't have copies of the presentation in short order.

CHAIRMAN POWERS: Your statement at the beginning was incorrect?

MR. FISCHER: My crystal ball failed me,

sir.

CHAIRMAN POWERS: Okay.

MR. PIERCE: But we'll have them. First of all, I want to start off by making some introductions. What you see up here is the Vogtle deployment organization. I just want to start by introducing our speakers for the day for the Southern Nuclear side.

First we have Jim Davis, who is our lead in our early site permit program. And he is going to be doing most of the talking today. He has most of the presentation throughout the day. He has one for this morning and the majority of this morning's presentation. And he has one this afternoon.

Secondly we have Tom McCallum. Tom is over here in the corner. He is in charge of our site development and also handles some site engineering. He will be talking about seismology and geotechnical issues this afternoon.

Finally, we have Ted Amundson here, who is currently working in our COL program, but earlier he worked on early site permit program. He developed our emergency plan. And so he will be talking for a few minutes this morning as well regarding our emergency

planning activities. And that comprises our speakers.

We do have a number of people here today to support discussions with -- to answer your questions as we may go through the day as well. For the Southern Nuclear people, if you go back a slide -- well, for the Southern Nuclear people, we first have a Buzz Miller, who is our Senior VP of Nuclear Development. And he is going to be in and out throughout the morning and afternoon.

Dale Lloyd, whom I report to, is the Vogtle Deployment Director. We also have Annie Spears, who is an engineer that works on our early site permit program.

We have Amy Aughtman, who has I think stepped out for a moment, but she is our lead engineer for combined operating license program. She will be here most of the day. We have Tom Moorer, who is our environmental lead project engineer. And, finally, we have here today Chris Boone, who is going to support questions and discussions on our emergency planning program.

And that comprises the people we have here for Southern Nuclear. I don't think I missed anybody.

CHAIRMAN POWERS: I'm sure we're going to

discuss the hydrology open item.

MR. PIERCE: And we have people here for that as well.

CHAIRMAN POWERS: Good.

MR. PIERCE: The hydrology open item will be, the people supporting that will be, Tom Moorer, Jim Davis, and some of our Bechtel people who are here as well.

We did use a number of contractors for our ESP program. And you can see the list here. Today we have brought in five Bechtel personnel to answer questions on hydrology, meteorology, and seismology around the room. John Prebula in the back heads that contingent.

We also have Dr. Robin McGuire from risk engineering. And he is -- let's see if I can say this right -- PSHA, probabilistic seismic hazard expert. He's also helped develop our SSE curves.

We then have Scott Lindvall of William Lettis and Associates here today. And he works in the area of seismology and geology. So those are the people who deal with the seismic.

We also have today a Westinghouse individual here to answer questions you may have on

the AP1000, Ms. Andrea Sturdis in the back. She will be here next week as well with an ACRS Subcommittee to talk about the AP1000 as well. So that's the staff we have here for discussions.

Before we jump into Jim Davis' presentation, you had asked about schedule. NRC, Christian has a slide or a couple of slides that deal with the ESP schedule this morning, I think, during your talks this morning.

This is a broader schedule of our overall program. And, just to sort of frame it, the major activity shown on this slide, we're currently looking at our ESP activities, ESP review, whatever is going on there. The screen just went off down here.

We're doing PSC certification, and we're working on our COL. We intend to submit our COL application to the NRC on March 1, 2008. And we're looking at about a 39-month review for the COL from that point forward.

When we get the ESP, we recently submitted a limited work authorization with our ESP program for safety-related work. We intend to, as you see there, start engineering backfill work once we receive our ESP. And that work would go on for about 18 months

while we're under the COL review.

Both of those activities would tend to come together in about June of 2011 and would hopefully in that time frame we would start construction. And then, of course, we're looking at start-up in around the January 2016 time frame.

So that's a broad overview of our schedule. I don't know if you have any questions regarding that, but -- no questions?

(No response.)

MR. PIERCE: With that, I'll turn it over to Jim.

- OVERVIEW OF APPLICATION

MR. DAVIS: Okay. Basically I'm going to just give an overview of the application and the contents and some of the preparation activities that we went through.

The Vogtle site is located -- well, it's a 3,169-acre site located on bluff on the southwest side of the Savannah River in Burke County, Georgia.

The site is directly across the river from the Savannah River site. It's about 150 miles from the coast, the mouth, in Savannah and about 26 miles southeast of Augusta, Georgia.

This next slide just gives you a 50-mile radius. It gives you an idea about the area surrounding the site. We're about 15 miles east of Waynesboro, Georgia.

This next slide is on the new plant layout in relationship --

CHAIRMAN POWERS: If you could come back to the previous one?

MR. DAVIS: Sure.

CHAIRMAN POWERS: Just a couple of questions. Maybe you can refresh my memory about the area and some about the information that you'll cover later on, but maybe you could just touch on these.

My recollection -- well, first of all, the really obvious thing is that you're just south of Augusta. And my recollection is somewhere between you and Augusta, there is an ammonia plant.

MR. DAVIS: I'm not familiar with that. We did evaluate within a five-mile radius for hazards at the site. And, to my knowledge, there is no ammonia plant within that five-mile radius.

CHAIRMAN POWERS: Okay. And you do have a major airport there, Bush Field.

MR. DAVIS: That's correct.

CHAIRMAN POWERS: And in looking at your discussion of the use at Bush Field, my recollection was that at one time Bush Field was used for training for Delta pilots. Is it still used for that?

MR. DAVIS: I wouldn't be able to speak to that. I know we did evaluate the Bush Field traffic because there is an air path. And we will cover that later in the presentation. As far as training for pilots, I am not aware of that or did any of our Bechtel guys investigate that as part of --

PARTICIPANT: I am not aware of that.

CHAIRMAN POWERS: Okay.

MEMBER MAYNARD: Just briefly -- you might cover this later -- the Savannah River, what kind of traffic, a little bit about the river there?

MR. DAVIS: We'll touch on that.

MEMBER MAYNARD: Good. Okay.

CHAIRMAN POWERS: "River" is a generous term here.

(Laughter.)

MR. DAVIS: Okay. This next slide just gives an idea about the layout of the new units. We have two AP1000 units. If you'll look to the -- the black is the existing units, PWR units. And the

orange are the new units here. You can see the new cooling tower layout.

Also we're going to add a new intake structure and discharge structure on the river. I just wanted to point out, which we're going to talk about in a few minutes, the green hatch line around the property line. That's our exclusion area boundary for the existing units and the new units.

And for the purpose of calculation, we went a little bit more conservative. You see the little green doughnut here on the slide. We have a power block circle in the middle. And then we drew a half-mile radius around that.

This doughnut in the center here is what we use for our calculations. To be conservative, we have to meet the limits at the exclusion area boundary. So we developed a conservative calculation to make it simple and straightforward so that our dimension is always the same.

We have a radius around the power block. And then a half-mile out, we drew another radius. And that's a power calculation EAB boundary.

In our application development, we had available to us the regulations, RS-002, which is the

processing guideline for early site permits; also the AP1000 site interface requirements.

The Vogtle site had a wealth of existing information that was available to us. We had the information from unit 1 and unit 2 licensing, also the SRS across the river. There have been a lot of studies and data done on both the river and the geology in the area. And that was available for us.

We also performed site-specific studies and analysis, including the boring and well test program. Also since we chose a site-specific design, we did a lot of conceptual design on things, like the intake structure, cooling towers, discharge structure, to support our analysis in the application.

You mentioned something about lessons learned. We did take a look at the first three applicants. And taking a look at their approach as a PPE versus a technology-specific application, we determined that there were some issues associated with that.

Specifically in the environmental area, to achieve the finality that we wanted to, we decided to go with a site-specific technology. And we chose AP1000.

What that allowed us to do was to do a real detailed layout, locate the plant so we could do our dimensional calculations as necessary. It allowed us to use the AP1000 design and use specific numbers for like effluent discharge and to do site-specific dose calculations.

In addition to that, we took a look at how the first three applicants approach emergency planning. And we elected to do a complete and integrated plan for our emergency plan. And we're the first ones to do that. So it has been quite a challenge. And I think you will see as we go through the slides we had a lot of questions on that because it was something new.

Basically our application had five parts: introduction, the site safety analysis --

MEMBER SHACK: Do you regret any of those decisions?

MR. DAVIS: No. We're still chasing our goal. So, even though it was hard in certain time periods answering all of the questions, I felt like we made the right decision. We were glad we did that.

Just an overview of our application. Five parts: the introduction, which includes information

about the owners. And the site safety analysis report is part two. Part three is the environmental report; part four, the site redress plan. And part five is the emergency plan. I've highlighted two and five because that's what the safety analysis report concentrates on.

We submitted our original application in August of 2006. One thing I want to just point out, we did ask for an LWA-1 as part of that, which is for construction preparation. And we could do the excavation of a hole using the LWA-1.

Our most recent revision is revision 2. We submitted a supplement in August of this year asking for an LWA-2. And this would allow us to do the safety-related backfill in preparation for initial concrete pour at COL. We were going to get the base slab for the nuclear island prepared for that.

CHAIRMAN POWERS: I don't want to underestimate the difficulties of the first concrete pour based on the troubles the EPR is having in Finland.

MR. DAVIS: Basically the safety analysis report follows an FSAR format. And ESP requires a certain subset of that. This slide illustrates the

chapters and topics that we covered in our application. And I'll go through those in a little more detail in the following slides.

- RESPONSE TO NRC ISSUES

MR. DAVIS: Basically we supported the NRC's efforts, both in site visits and in response to RAI letters. We had six visits. One free application visit that the NRC conducted in October of '05 was for our boring program. They came to the site to review that.

Subsequent to our application submittal in August, the first visit they had was at corporate. And they covered our quality assurance program and our controls over the ESP application development.

In October of '06, we had our first site visit. A big audit team came in. It was on environmental. during the environmental review, we also had the emergency planning group individual. I think it was one individual who came down for that. We followed up in November, December, and January with hazards and security, meteorology, hydrology, and geology.

The result of the site visits, from questions before and after, we had 189 RAIs. If you

look at how those were broken down, if you count the subparts, we counted 313.

Southern Nuclear feels like we had a very, very thorough review by the NRC. We supported that review in our responses and responded to all of those.

- SCHEDULE

MR. DAVIS: The results after the review were the SER with open items. We had about 40 open items with the SER. We responded to the 40 with promises for additional data on 13 of the open items. This additional information was either tied to new analysis, new testing, or COL testing. So it was scheduled out into the future. It's going to take us one to two months to get the rest of the information in.

Basically what I am going to do now is kind of break down some of the sections and go through those, try to hit what is in each section, and make some key inputs to those.

Chapter 2 is the site characteristics. And 2.1 on geography and tomography, we established the site boundary for our release limits, identified our exclusion boundary and the control by the applicant, and also dealt with the population

distribution for analysis later in the application.

The exclusion boundary again is the same one we used for unit 1 and unit 2. We used the most recent Census data. And we have projected that out to 2070. That would give us the 20 years of the ESP duration plus another 40 years for the operation of the unit. So we projected out to 2070.

Just one key point. If you didn't notice in the maps earlier, Vogtle plant is out in a very rural environment. The next slide kind of illustrates some of the population.

CHAIRMAN POWERS: I think it would be useful if you reminded the Subcommittee how you handled the Savannah River and its population and, in particular, how that population at the Savannah River might change if, in fact, DOE's plans for an actinide burner were implemented at that site.

MR. DAVIS: You emergency planning types help me out here.

MR. AMUNDSON: Yes. I'm Ted Amundson. I'm lead engineer for emergency planning. Southern has an agreement with the Savannah River site such that should there be a problem, we notify Savannah River site. And they take care of all emergency

planning, including the evacuation of their personnel if necessary. They have relocation centers on the site itself and would move people if necessary.

We also have agreements with Savannah River to continue the development of those emergency plans as we move forward. And I have not had any or we have not had any contact from Savannah River yet, but should they add to their facilities, we would then get into discussions with them and make sure that we have mutual abilities to support each other in terms of our emergency planning.

CHAIRMAN POWERS: I'm absolutely positive that would go on because they're required to do the same thing.

MR. AMUNDSON: Right.

CHAIRMAN POWERS: They have their own set of requirements. The question is, when you develop these projections, what do you do there?

MR. DAVIS: Well, the population, you know, a workforce -- and you all correct me if I get off the path here, but the workforce is not really what we count. We do that for evacuation purposes. What they do is the population, resident population. Okay?

Because you don't count workforce and population because if you work in the area, you generally live in the area. And that would be kind of double counting.

What they do is they take the Census data, and they have looked at the growth patterns for the area and the percentage of growth through the years. And they take, you know, the most recent data from 2000. And then they project that out with the same percentage of growth out into the future.

So it's based on where people live more than where they work.

CHAIRMAN POWERS: Yes. But the one thing that violates that is this block that occupies about a quarter of your segment out there at Savannah River, where right now that block that is within your circle is a bunch of trees and a facility that is really not operational right now.

But that can change if DOE's mission for the laboratory changes. And the people that will work on that will not live there.

MR. DAVIS: That's correct.

CHAIRMAN POWERS: They will be distinct. And instead of a constant, you get a step change.

MR. DAVIS: So are you concerned about the number of people that work there or the potential for a large increase in number of people who live in the area?

CHAIRMAN POWERS: It's really the people who work there.

MR. DAVIS: Okay. Well, in that case I think that --

CHAIRMAN POWERS: I think any change in where they live is actually reflected probably in your numbers to the accuracy that you can do those numbers.

MR. DAVIS: Well, I think Ted's answer, I'll rely on that. I mean, if there is a large change in the population, I mean, the emergency planning efforts are a fluid process. And if we needed to revise those to address additional numbers there, we would.

Chris, do you have anything to add?

MR. BOONE: Yes, I would just say that -- I'm Chris Boone with Southern Nuclear Emergency Planning. We coordinate very closely with the Savannah River site and their emergency planners based on their future plans that they can share. And any impacts that they would see to our emergency planning

efforts obviously would impact theirs as well. And so we coordinate those efforts very closely to keep these fluid plans on both sides, both their plans and our plans, effective.

So if they have plan construction or if they are going to shut down a particular operation that they have and relocate those employees, they modify those plans and coordinate that effort with us.

CHAIRMAN POWERS: I noticed in your inspections that you did include the planned plutonium fabrication facility that they are contemplating building on that site, but you didn't seem to have the pit extraction facility there. I wondered why that was.

MR. BOONE: Which facility is that?

CHAIRMAN POWERS: Well, it's a facility that actually feeds the plutonium fabrication facility.

MR. BOONE: And I would think that the numbers that would have been provided to us by SRS would have included the full staffing for that facility, including all the supplementals.

CHAIRMAN POWERS: Okay.

MR. PIERCE: We can check into that and

get back to you.

MR. BOONE: Right.

MR. PIERCE: That's probably a better way to deal with that, then, because I don't think we have the answer right now.

MEMBER MAYNARD: Did you say that if they increase their staff or workforce they're the ones responsible for the evaluation of their workers if there's an issue at Vogtle?

MR. AMUNDSON: That is correct.

MR. BOONE: That is correct. In essence, we kind of tricked the Savannah River site as if it's a separate local entity, as if they're a stand-alone county. And we notify them in the same methods that we would with state and local agencies. And then they're responsible for taking those actions with those people.

We make a recommendation. They implement, just like we do with state and local governments. It's a little more closely coordinated because they're not physical residents. They're actually employees. And some of the facilities, you know, they have duties just like we do.

CHAIRMAN POWERS: And the other feature is

that unlike the other counties, where you can count on kind of a sustained growth, these guys can have actually a step function.

MR. BOONE: Right.

CHAIRMAN POWERS: And have in the past.

MR. BOONE: In both directions.

CHAIRMAN POWERS: Yes.

MR. DAVIS: Just these are numbers and data and tables from the application itself. You have the low population zone, which is out to two miles, and you have also numbers on the zero to ten miles resident population, which also reflects our emergency planning zone as well.

CHAIRMAN POWERS: Now, if you look at your 50-mile zone, you project -- what's that? -- about a factor of 4 increase in population over the next 70 years.

MR. DAVIS: Right.

CHAIRMAN POWERS: But when I look at your projections on the usage of Bush Field as an aircraft site, I don't see quite a factor of four increase there. And it would seem to me that usage of an airfield in the population ought to be roughly proportional with each other. Am I wrong in that?

MR. DAVIS: I'll default to --

CHAIRMAN POWERS: Only ground-based people come in and live in the area?

MR. DAVIS: I'm not as familiar with the analysis on the field. We did look at Bush Field and the population there -- I mean the frequency of travel and performed the calculation for hazards that determined that, you know, based on the frequency in numbers. And I think we're pretty conservative in that because we assumed, we made some pretty conservative assumptions to calculate the impact on the site. And we were okay there.

Bob, do you have anything about growth in the air press travel as a number for population? Did we consider that?

MR. PRUNTY: Not as relates to population, no.

MR. DAVIS: We can take a look at that and get back to you on that.

CHAIRMAN POWERS: My recollection, I don't have the numbers in front of me. This high kind of dropped down and then came back up to its initial high. It didn't quite go out to 2070 in the table that I looked at, but it did not reflect this kind of

growth in the zero to 50 miles. And I would think that zero to 50 miles would be users of that facility. And it's difficult for me. I mean, I don't know. But I would think that use of airfields would roughly correspond to populations.

MR. DAVIS: Okay. Dan, do you want to?

MR. PATTON: Dan Patton with Bechtel.

We took the projections for Bush Field based on FAA data. And they project out to 20 years in the future. So our traffic count was based on that as far as the FAA would go.

CHAIRMAN POWERS: And why is that adequate?

MR. PATTON: Well, it's as far out as we could see. And we base the traffic count. We use that traffic in and out of Bush Field to estimate the air traffic along the air corridor that Jim will get to in just a moment now, so to do the probabilistic evaluation of aircraft hazards.

CHAIRMAN POWERS: Okay. Well, I'm perplexed.

MR. PIERCE: I think what he's asking is, do we feel the FAA projections to be adequate, I mean, appropriate projections for what the increases will be

in airfield use based upon our knowledge of population. I don't know if I can answer that right now.

MR. PATTON: The projections couldn't go out to 2070, where we did the population projections. There for the population projections, we were trying to show that even out at end of license life, the population density would be less than 1,000 per square mile.

So this projection for the aircraft hazard was about as far out as we could go based on solid data from the FAA, felt like it was adequate for assessing the hazard.

CHAIRMAN POWERS: Let me ask the staff, how did you feel about this comparison? They went to 20 years. And I think you're right on that. They went to 20 years on their projection on the Bush Field usage. They go to 70 years for the population.

The 70-year projection is roughly a fourfold increase; whereas, the area you see, Jim, it's funny-looking. It's high, drops down, then comes back up to about the same as the high. I mean, it hardly changes.

And that's not out of line, actually, with

the population projections for 20 years. But it's wildly different from the population projection for 70 years. And 70 years seems to be the time period we're looking at here.

MR. TAMMARA: This is Rao Tammara for NRC, NRO safety evaluation.

We looked at the data that provided in table 10.5.1. And if that table is looked at, actually, they have predicted from 1990 to 2025. And the aircraft traffic decreased until 2009 and slightly again increased. So the date of increase is not that dramatic as compared to the population.

And it is not even a factor of two. So it is not a direct ratio with the population. So we assumed FAA data is reasonable. And when we calculated the probability, we came up with much an order of magnitude lower than what the licensee has calculated.

So there is a built-in factor for the probability also. Therefore, we concluded the number of flights are reasonable. That's the way we evaluated.

CHAIRMAN POWERS: I can safely say I don't understand. I guess we'll have to look at the

numbers.

Please continue.

MR. DAVIS: Okay. Section 2.2, "Discuss potential hazards." We looked at industrial mining facilities, transportation routes, including airports, roads, rails, and water, military facilities. We also evaluated the existing units 1 and 2 for potential hazards.

Somebody mentioned earlier the river traffic. It has changed significantly from when unit 1 and 2 were evaluated. Basically there is no barge traffic past this site, just the economics of barges delivering the stuff or not feasible. The Corps is not really maintaining the rivers, not really required right now, for the barge traffic. So our conclusions were there were no hazards because there was no traffic at this point in time.

Another key input to us was SRS, what kind of chemicals were there. Also, the rail traffic that's within the five-mile radius is on SRS. And they get their chemicals delivered. So there was a lot of data that we had to gather from those people there. And they were very helpful working with us on that.

Just to illustrate a five-mile circle, here is the five-mile circle. It shows the roads, the transportation routes, the SRS in the facilities that are within the five-mile radius, also the rail line that passes through that circle.

CHAIRMAN POWERS: There were a couple of things in that section of the chapter that -- maybe I was reading it too quickly and wasn't following very well and whatnot.

For instance, on page 2.2-13, you say, "Carbon monoxide is an asphyxiant." Well, true, but more importantly is that it's a nerve poison. And I wondered if you didn't mean carbon dioxide in that section, which is an asphyxiant.

MR. DAVIS: Okay. I will defer to my technical experts up here. Bechtel, can you address that particular issue? Do you have a copy of the --

CHAIRMAN POWERS: Well, maybe you can look on because on the same page, you are talking about what transports. And there is no mention of other things he did, transported frequently.

I mean, you apparently talk to the rail company. And they say they don't move either hydrochloric acid, chlorine, or sulfur dioxide, which

I would say, gee, that is remarkable because I don't know of any rail lines that don't move those.

MR. DAVIS: Bob, is that rail line for delivery at SRS or does it pass through and go on? Is that a major transportation route? Can you guys answer that?

MR. PRUNTY: I can speak to that. That is the CSX line that goes through the site on to Augusta and down to Savannah.

MR. DAVIS: And we contacted both the rail line and Savannah River site to determine the composition of the shipments and what hazardous chemicals were necessary for us to evaluate.

If we didn't identify something that you expected, I don't know that we --

CHAIRMAN POWERS: There's not much that you can do except that's what they did.

MR. DAVIS: Right. We analyzed what they told us.

CHAIRMAN POWERS: That's kind of remarkable.

MR. PIERCE: But regarding the carbon dioxide/carbon monoxide issue, we will look at that and get back with you.

CHAIRMAN POWERS: Yes. It may just be a misprint.

MR. PIERCE: Yes. We can look at that and get back later in the presentation, I would think.

CHAIRMAN POWERS: CO_2 shipments would be not unusual. And it is an asphyxiant; whereas CO would be a little surprising. And, true, it is an asphyxiant, but that is usually not what the cause of the problem is, the blood poison.

MR. PIERCE: We will check on that. And that is on page 213 of --

CHAIRMAN POWERS: I have it listed here in my notes as 2.2-13.

MR. PRUNTY: It's in the context where we are talking about accidental spills of carbon monoxide or ETMLs. And it actually states they're not expected to cause an explosion or vapor hazard. And then it goes on to say, "carbon monoxide, which can cause asphyxiation, were quick to vaporize and dissipate."

MR. FISCHER: Could you please identify yourself for the court reporter?

MR. PRUNTY: I'm sorry. Bob Prunty, Bechtel Licensing.

CHAIRMAN POWERS: And, see, carbon

monoxide is combustible. I don't know that I would expect it to explode, but it is combustible. It's like it's a misprint.

MR. PIERCE: Can you look at that and advise later on today whether you think it's a misprint or not? Okay.

MR. DAVIS: The next section is meteorology. In this section, we identified and kind of categorized the regional and local weather. We presented --

CHAIRMAN POWERS: Before we step onto that, could we just touch on another one of the hazards?

MR. DAVIS: Sure.

CHAIRMAN POWERS: I mean, there are a lot of trees here. So you worry a little bit about forest fire. And what you say, "Analysis of a postulated fire indicates there's no problem." And that's all it says.

And I wondered, where do I go to look for this analysis?

MR. DAVIS: Well, we have backup files and analysis that supported what the content of the application is. And the NRC reviewed all of that

information. Anything that they wanted we provided.

MR. PIERCE: But is that at Bechtel? Is that analysis at Bechtel? That's really --

MR. DAVIS: It would be at Bechtel.

CHAIRMAN POWERS: It did not give me a reference or a citation or anything that I can identify other than it says, "An analysis of the postulated forest fire indicates" and went on to say that it was no surprise. That was a little bit surprising because, I mean, usually the trees were right up to wherever you clear things out.

MR. DAVIS: Maybe Tom Moorer? Could you maybe address the site and the trees and our management of those and whether or not fire might be an issue or not?

MR. MOORER: I'm Tom Moorer. I'm the environmental project manager for the project.

We have a wildlife and land management program that we use to manage site resources, including timber. And we do active things, such as control burns in certain areas to control undergrowth and that kind of thing, to limit the effects of forest fires in the pine stands.

Along the river bluff, which is a fairly

heavily wooded area, between there and the actual site, there's a lot of open area that would give you plenty of opportunity if you were to have a fire in that area to react and fight it in a way that wouldn't impact the site significantly. But we do proactively manage the timber on site.

One of the things we look at, in particular, in the pine stands is undergrowth controlled to limit the effects of forest fire if it were to occur.

CHAIRMAN POWERS: Who would respond to a fire on this site?

MR. MOORER: We have a plant fire brigade that would respond. And we also have agreements with the local fire departments provide support, if necessary.

CHAIRMAN POWERS: And which localities are those?

MR. MOORER: The City of Waynesboro as well as some local areas. I'm trying to think of the little cities. Gerard is one. Sylvana is one, all volunteer facilities. Waynesboro would be the largest facility. And we have agreements with all of those local ones.

CHAIRMAN POWERS: Let me come back to the chemical hazards on the site. I noticed in table 2.2-5, you had some listing of some things that it would be difficult to understand but raised the question in my mind.

You listed 4,000 gallons of sodium bromide. Well, sodium bromide is a solid. So I don't know what 4,000 gallons of it -- I'm sure you don't mean that much solid sodium bromide.

Sixty-seven hundred gallons of sodium hypochloride. And, again, I'm sure you don't mean that much sodium hypochloride. You mean a solution thereto. But you didn't indicate the concentrations there, nor did you indicate to me what would happen if I mixed those two solutions.

MR. DAVIS: Bob, can you all address that or somebody from Bechtel? I know we evaluated the tanks individually, but I don't know that we postulated that there is any combination. Tom Moorer, did you want to try?

MR. MOORER: I'm Tom Moorer again. The two chemicals that you mentioned are used for water treatment for the cooling towers. And, like you said, they're both solutions. It's not a solid material.

The sodium hypochloride is typically in a 10 to 12 percent solution as applied, and the sodium bromide is in the same range.

Those chemicals are normally mixed together. They're actually fed together on a ratio of about four to one bromine to chlorine to provide an activated -- I don't know if you know anything about bromine chemistry, but the way you use bromine, hypochloride has to be used to activate the bromine to make it work in an aqueous solution. So it's about a four to one solution.

CHAIRMAN POWERS: What you're saying is the hypochlorides chooses to oxidize the bromine to create bromine gas?

MR. MOORER: Yes, sir, that's correct, in the aqueous matrix.

CHAIRMAN POWERS: And dissolved in the gas. And how much partitioning of that bromine out of the gas would you get?

MR. MOORER: It's very, very small. In fact, you don't get enough to even matter. You know, there's a quite a bit of information.

CHAIRMAN POWERS: It matters to the bugs in the water.

(Laughter.)

MR. MOORER: Well, I mean, that's why you put it in there.

CHAIRMAN POWERS: Okay. Similarly, you have things listed on your table that are a little hard to look up. This is table 2.2-6. You have oxygen scavenger, pH addition, dispersant, corrosion inhibitor, scale inhibitor, biocide, algicide.

None of these are very helpful in identifying what the chemistry is. So I didn't know how to react to it. I said, "Well, I've got these things. I have no idea whether" -- I mean, I'm suer that it poses a hazard to the algae, but I'm not sure it poses.

MR. PRUNTY: This is Bob Prunty.

Those are the AP1000 chemical information that we had available from Westinghouse at the time. Those are all units 3 and 4 projected chemicals, which we got from the --

CHAIRMAN POWERS: Those will really show up in the COL application.

MR. PRUNTY: Yes, sir.

CHAIRMAN POWERS: Thank you.

MR. DAVIS: The meteorology. In this

section, we characterize the regional-level letter. We presented five years of on-site data. And we developed the site-specific diffusion estimate for use in our dose calculations later.

Basically one of the major inputs was the five years of on-site data, which we worked to pedigree and get it cleaned up. There were certain little segments of maybe bad data that we got from either the backup met tower or other sources of calculations to present a good five-year block to do our evaluations with.

In addition, we also used information from the national weather stations nearly within a radius around the plant to identify our weather extremes. The next slide just shows you how close those stations were and identifies the stations that we use.

2.4 was hydrologic engineering. In this section, we evaluated the potential for floods, dam failures, storm surge, ice effects, low water events, groundwater impacts. And, in addition, we had an accidental release evaluation in that.

Some of the key items that were inputs were groundwater data from new wells that we developed for the ESP, in addition to the existing on-site well

data that we used that had been monitored for a long period of time.

We did a site-specific radioactivity release analysis from the AP1000 design, the release that was postulated there to the groundwater and evaluated that.

One key points is the benefits to the Vogtle site is the elevation of the site is about 140 feet above the normal river level. And this next slide just kind of gives you a feel for that.

This section we will cover in a lot more detail this afternoon. Tom McCallum will be making that presentation. Here are the subject areas covered by geology. Some of the key items were this little rock profile, the SSE, and our evacuation plan.

CHAIRMAN POWERS: Well, could we before we go on come back and chat a little bit about the meteorology?

MR. DAVIS: Sure.

CHAIRMAN POWERS: You use a lot of 30-year averages on the meteorology. And I wondered, why is that 30-year average problem appropriate?

MR. DAVIS: We did have an open item on that. Dan, would you like to? Dan Patton of Bechtel,

can you respond to that for us?

MR. PATTON: This is Dan Patton.

The use of 30-year average is a fairly standard meteorological set, data set. From the nearest first order station, which is Augusta, we've got reliable data going back 30 years. Where we needed to, we would take that data and then project. I come up with 100-year return values as appropriate.

CHAIRMAN POWERS: So in the end, you use 100-year return values, but they're based on 30-year data sets?

MR. PATTON: That's correct.

CHAIRMAN POWERS: Did you look at these stations when you were getting your 30-day data? The reason I ask is there is a Web site which shows some of the National Weather Service weather stations and how inappropriately some of them are located, obviously iconoclasts. And some of them are hilariously inappropriately located.

And I wondered if you had actually looked at these stations to see if they were giving you reliable data. I have no evidence that they are not.

MR. DAVIS: When you say, "looked," do you mean visited?

CHAIRMAN POWERS: Yes, actually go physically look at them.

MR. DAVIS: I don't believe that we visited them. You know, in a lot of cases, we were trying to establish what the extreme event was, like the highest temperature or the largest storm or something to that effect.

So I don't know that we really considered whether that was necessary. We were just trying to identify the extreme event and try and be as conservative as we could on our analysis.

Dan, can you add anything to that or --

MR. PATTON: Well, as I mentioned -- this is Dan Patton -- we took much of our data from the nearest first order station, which was Augusta. The cooperative stations we selected were to represent all compass points and in the vicinity of.

So that's pretty much what drove the selection of those points. They are cooperative stations in the National Weather Service. But we did not go out and inspect or --

CHAIRMAN POWERS: I have no evidence that they are inappropriate. I just encountered this Web site that is absolutely hilarious because some of them

are horrible. I have no evidence that any of these were, and I did look.

The issue, in thinking about meteorology for the East Coast, we have quite a little data, in fact, for this general area. We have at least gross data going back to 1750, most of it reflecting roughly 50-year cycles in the weather.

And so when we look at 30-year weather to project forward, are we indeed capturing 50-year cycles and things like hurricane frequencies and stuff like that, which I presume have an impact on also tornado frequencies?

MR. DAVIS: Dan? We looked at historical record for hurricanes. I know we looked at more than 100 years. Can you elaborate on that for us?

MR. PATTON: For the severe weather, we went back as far as we had recorded information. When I was talking about the 30-year data that we took, that was reliable hourly data, precipitation, and what have you. For the history of storms and severe weather, we went back as far as we had recorded information.

CHAIRMAN POWERS: You ended up having to put in tornado problems.

MR. PATTON: Yes, we did.

CHAIRMAN POWERS: I'm wondering, do we capture cycles, 50-year cycles, in this database?

MR. PRUNTY: This is Bob Prunty.

For the tornado frequencies, we actually used DG1143. And the region that Vogtle is located in gave values for maximum wind speed and other tornado data. That draft guide contains a probability of current 10^{-7}.

We did not actually do a site-specific probabilistic analysis. We used DG1143. Given the Westinghouse site characteristics that they assumed, these numbers were compatible with that. We were enveloped by what they assumed in their design.

MR. DAVIS: Okay. Any more questions?

(No response.)

MR. DAVIS: Okay. We will move on, then. We're on hydraulic engineering. Let me just go to that sketch.

CHAIRMAN POWERS: I think we were going through geology and science.

MR. DAVIS: Okay. Some of the things that we discussed this afternoon, soil and rock profiles, safe shutdown earthquake, and some of our excavation

plans.

CHAIRMAN POWERS: When we go through that, I hope we can talk about the Weems ridge.

PARTICIPANT: What?

MR. DAVIS: Yes.

CHAIRMAN POWERS: Weems ridge.

MR. DAVIS: The ridge?

CHAIRMAN POWERS: Lots of little waterfalls that seem a little more precipitant than one would like and how one interprets those data.

MR. DAVIS: We will have our seismic group respond to that this afternoon.

Aircraft hazards. We did mention that. That was covered in chapter 3, specifically the ESP is required to evaluate this. The key issue for us was the Savannah route, V185.

This next slide illustrates how close it was to the plant. Based on the analysis, the frequency there, it was, the hazard was, within acceptable limits for us. You can see the location, a very close distance to the plant site.

CHAIRMAN POWERS: Forgive me for maybe reading things too quickly, but I did not understand exactly what your arguments are for the Bulldog and

the military point.

It would seem, if memory serves, to suggest that the military activity was going down in that area, even though the expansion of the military field was going on.

MR. DAVIS: The areas of the military, the Bulldog area, are identified on this particular slide. And I'll let Bechtel. If we have somebody there for aircraft analysis, could you all address that? I know it's based on a straightforward calculation and distance the aircraft would come in relation to the site.

And the way I understand it -- and you all help me if I go off here -- the only one that was close enough that drove us to evaluate it per the regulation was the Augusta to Savannah route that came within a certain distance of the plant.

The defined area for the Bulldog was I understood not within that range, that we had to evaluate it specifically. Is that correct, Bob?

MR. PRUNTY: That is. This is Bob Prunty. That is correct. The military training routes are actually discussed in much more detail in the 2.2 hazards section. And we have plotted them out, as you

see, and got what their training routes were. They were within the criteria for evaluation.

CHAIRMAN POWERS: So they're coming closer to you but still don't have to worry about them.

MR. PRUNTY: Right.

CHAIRMAN POWERS: And their activity rate seems to be going down, even though they made their facility bigger. Your job is not to explain our military to us. Okay.

MR. DAVIS: Chapter 11. One thing that I will point out here is that we were the first ESP to actually include this in the safety analysis port.

The first three applicants included this evaluation as part of their environmental. And it wasn't part of our initial submittal, but at the NRC's request, we turned it into a safety-related calculation, updated it, and put it into the SSAR as well.

We discuss liquid rad waste and gaseous rad waste from mineral operations. So this was a new calculation for us under ESP.

Here are some of the limits. It indicates both the liquid and gaseous for the AP1000 design. We are well within the regulatory limits for both

effluents.

Chapter 15 we're going to talk a little bit more about this afternoon, but basically we applied the AP1000 accident numbers to use specific site data to compare the site analysis to the Westinghouse. And we were bounded by the Westinghouse analysis.

CHAIRMAN POWERS: I have to admit that some of the tabling there left me confused. There is a discussion on whether ground-level or elevated releases are more conservative. And the argument is advanced that ground-level releases are more conservative, even though your population in the immediate vicinity of the plant is very low. And one might think that a little lofting would lead to greater hazard. Unfortunately, it is probably too much of a statement.

I didn't find a comparison between the two to lead me to say that, yes, verily, a ground-level release is the conservative approach here.

What did confuse me further is that where you have results labeled as ground-level releases, they are, in fact, ten-meter elevation releases, which is roughly ground level, I suppose.

Did you do a lofting calculation to see if a 100-foot release wouldn't be less hazardous to the population than a 10-meter release?

MR. DAVIS: Let me turn to our technical experts for responses. Dan or Bob?

MR. PATTON: We do a sensitivity analysis when we're making these evaluations. The elevated releases typically result in greater dispersion. In order for a release to be considered elevated, it needs to be greater than your tallest building.

So the ten-meter release is called the ground-level release. And with a low-level release like that, there is less dispersion, less atmospheric dispersion. So it winds up being conservative.

CHAIRMAN POWERS: Yes. But the problem I see in my mind is that the immediate vicinity has a relatively low population density. If I get a little lofting from the top, say the top of the AP1000 dome release, do I get into a bigger population density?

Does that compensate for the dispersion, the additional dispersion? I don't know. Maybe you do. Maybe you don't. But I didn't see the number that said, yes, this is indeed conservative.

MR. PIERCE: Bob, did you have something

you wanted to add? They're thinking, I think.

CHAIRMAN POWERS: Well, maybe we can --

MR. PIERCE: We can come back. I might ask Chris Boone. Chris, when we do our emergency planning, we have the model that models the plume and stuff. Do we model ground release or elevated release?

MR. BOONE: Yes, both.

MR. PIERCE: Both? And it takes into consideration the characteristics of the wind and the direction and how much the plume disperses over the area.

CHAIRMAN POWERS: That's one I hope we have a chance to discuss a little more because I don't know the code they're using. Most of those plumes are flat Earth codes.

And you have a river basin running right down your site. And I would expect your plume just to track right down that river basin. And I would expect it not to be a flat Earth.

MR. DAVIS: Since we're going to cover this topic this afternoon --

CHAIRMAN POWERS: Right.

MR. DAVIS: -- you know, we will gather in

our bright times. And we will try to be prepared to answer that.

PARTICIPANT: That would be great.

CHAIRMAN POWERS: More efficiency anyway.

MR. DAVIS: Okay. Chapter 17 is our quality assurance program that we use to develop our application and the controls we applied to both developing the calculations and gathering the data. There is a lot of data gathering that wasn't necessarily "site-related," but we did apply QA controls on all the data that we gathered. In our recent submittal, we have expanded our QA program to also cover these early LWA activities as well.

And next I am going to turn over to Ted to just talk about chapter 13 and part 5 of the emergency plan.

MEMBER MAYNARD: On your data-gathering sections, weather and stuff, did you rely on any internet data or was it all through official communications or documents? My main question is, did you rely on any internet information?

MR. DAVIS: We did rely on internet information. We established some QA controls for that purpose. Bob, do you want to describe that for us,

just Bechtel's process for using internet data?

MR. PRUNTY: Yes. This is Bob Prunty.

We did use internet data. However, we did use it from the national authority-type sites. And we captured that data with screen shots and validated that it was what it said it was.

And that's in our QA records because some of these Web site pages obviously change from day to day. So we have captured that data that we did use at that time frame.

Many of the internet sites are essentially textbooks and references books online. So we did use that data.

MEMBER MAYNARD: Okay. But you sounded like you did something to validate that it was an official site, like weather or whatever. How did you validate? You pulled something up on a screen. You said you did a validation.

MR. PRUNTY: Well, that the site was correct, you know, for weather, used NCDC and National Weather Service sites. And hydrologically we used Corps of Engineers data and others from nationally recognized sites, not a Google search just to find out where there might be some information on that.

We started from sites that we knew to be accurate through just the technical expertise of our people that use these things in their performance of their daily jobs. They use those sites that are there for that purpose.

MEMBER MAYNARD: Okay. And you took basically a screen shot. And that became your reference document? It's not the internet site, then, in the future? It's the picture that you took of that?

MR. PRUNTY: Yes, sir. For those things that change from day to day, you may go back and look at it in a month. And that data may no longer be there. We took screen shots of that and captured that in our plant records so that you can go back and say, "Okay. On this day, that is what that data showed" because some of it changes, as you know, on a day-to-day basis.

MEMBER MAYNARD: Right.

MR. PRUNTY: Others there is a lot of historical information on some of these sites. You can go back, you know, many years and recapture that.

CHAIRMAN POWERS: But the question I think Otto was asking you, especially on the historical

data, you know, historical data says 1845. How do you know that that 5 is the number that should be there and not something that a 13-year-old put there in malicious intent to decorate the site with his tagging?

MR. PRUNTY: I guess we rely on the Web control of the controlling organization. As I said, we didn't go out and Google information. We used those sites that control and police the data that's there.

CHAIRMAN POWERS: You did not go back to the owner of that site and say, "Okay. This Web page is good, right?"

MR. PRUNTY: No, we did not.

MEMBER MAYNARD: We know what they did. We know what they did.

MR. AMUNDSON: Well, good morning. I'm Ted Amundson. I'm the lead engineer for emergency planning for the early site permit application at Southern Vogtle plant.

I am going to be talking mostly about emergency planning as far as part of the chapter 13 programs discussion. I will touch very briefly on section 13.6, "Industrial Security."

Some of the key items that we looked at here in chapter 13 are the physical characteristics that were evaluated for security and emergency planning requirements. And also we note that we provided the details of emergency planning in a separate part of the early site permit. And that would be part 5. That's where we're going to spend most of our time this morning in our discussions.

The regulatory considerations for emergency planning we discussed in part 5 of the application come from 10 CFR 52. and the main requirement that comes out of part 52 in regards to emergency planning is that we are to identify significant impediments to emergency planning should they occur.

In addition, part 52 provides for two options in regards to emergency planning. The applicant has at their option to propose major features of the emergency plan or the applicant may propose complete and integrated emergency plans.

Southern and the Vogtle site chose to avail themselves of a second option. And that is to provide a complete and integrated emergency plan.

Now, the reason that we did that primarily

was that the existing Vogtle plan on which the new plan is based was one of the last that was really developed in this country.

Vogtle is one of the last plants licensed. Consequently, the existing Vogtle plan has a high degree of compliance with the planning standards that are in existence today. So it became a fairly easy choice for us to go ahead and propose an emergency plan, complete and integrated emergency plan.

The plan that we provided is really intended, of course, to comply with the emergency planning regulations found in 10 CFR 50.47 and also 10 CFR 50, appendix E.

The regulatory guidance that the staff uses, really, to evaluate our plans to assure that we are complying with those regulations is found in NUREG-0654, FEMA-REP-1. And you will that our emergency plan is really structured and intended to follow quite closely with the outline in the standards contained in NUREG-0654.

If one avails themselves of the option to provide a complete and integrated emergency plan, part 52 also requires, then, that we propose emergency planning ITAAC. And we did that in our application.

The guidance that we used primarily for the submission of those proposed ITAACs was found in SECY paper 05-0197. We also used draft guide 1145 as the provided additional guidance on what should be contained in the emergency plan ITAAC. And we did use that as guidance for us.

We did not use reg guide 1.206 since that was actually published after we submitted our application. So we could not avail ourselves of that guidance.

In addition, part 52 then also requires that if we provide a complete and integrated plan, that we also go out and obtain state and local certifications. And those certifications are required in three general areas: first of all, that our proposed plans are practicable, that we can implement what we are proposing; that those state and local agencies are committed to further emergency plan development; and, finally, that those agencies are committed to executing their responsibilities under those plans.

We did go out and obtain new certifications in those areas from our state and local agencies. We already have a set of existing

agreements with all of those state and local plans.

And we will continue to maintain those existing plans, but we did go out and get new certifications for purposes of the early site permit application. And we obtained those and submitted those to the staff for their review.

CHAIRMAN POWERS: You did not encounter any resistance in that process?

MR. AMUNDSON: We did not, no. We have had a long and positive relationship with the various state and local agencies, including the States of Georgia and South Carolina and the four counties that we do business with and the Savannah River site.

And I think it's fair to say, Chris, that we have had a positive relationship with those agencies and continue that relationship today.

CHAIRMAN POWERS: Can you explain to us a little bit about your philosophy -- it may come up in the presentation, and I will wait -- a little about your philosophy for evacuation versus sheltering?

MR. AMUNDSON: Well, we do have in our planning bases both the option of sheltering and evacuation. And perhaps I should defer to Chris in terms of a little more detail on what that philosophy

would be.

MR. BOONE: We follow the guidance for developing and implementing the protective action recommendations and submit those, of course, to the state and locals. But the ultimate decision on what is performed obviously lies with those agencies.

But we do coordinate our process for developing those recommendations with the state and locals. And typically we follow the guidelines of 1-rem TEDE and 5-rem thyroid CDE for evacuation for the tags. And then the sheltering includes not only those areas which may be less than those limits, but we include inclement weather and hazards and those sorts of things in accordance with the guidelines.

CHAIRMAN POWERS: And so if you are following the guidelines, my recollection is these guidelines are based on hypothesizing an event initiated at the plant under power operation and not hypothesizing an event initiated by, say, an external event; that is, a large earthquake, that might interfere in the infrastructure available for evacuation. I think that's true.

MR. BOONE: That's true except the guidance 2 also asks you to consider any hazards that

might be in the area that would prevent implementing the recommendation. And that is a consideration of the site, understanding that if the event begins with an earthquake, we may not be fully aware of external input that may be miles away from the site. And that's why we make the recommendation and then ultimately the state and locals make the decision to want to implement because they are more aware of those.

But we do coordinate as well as the event unfolds. They would make us aware of those limitations, and we would consider those in future evaluations.

CHAIRMAN POWERS: I did not see in the site, in the area of your planning region, anything that was required what I would call special consideration, prisons, mental hospitals, and things like that.

MR. BOONE: That's correct.

CHAIRMAN POWERS: You are relatively free of those --

MR. BOONE: Right, of those complications.

CHAIRMAN POWERS: -- complication --

MR. BOONE: Yes.

CHAIRMAN POWERS: -- that are just difficult to handle?

MR. BOONE: Right.

MR. AMUNDSON: We have one special population identified. It's a relatively small home-type school located about nine miles from the plant. It has a student population on the order of 50 with associated staff of 20, something like that, so relatively small population.

CHAIRMAN POWERS: And you've found a way to handle that?

MR. AMUNDSON: Well, of course, they are a certified school. And in order to be certified, they have their emergency plan. If you follow the correspondence, it's a relatively new school. And so it's a relatively new addition to the Burke County emergency plan. We did identify it in our evacuation time estimate studies. We picked up on that.

It did generate a couple of questions from the staff. We had to explain a couple of apparent differences on the approach that we used on evacuating that group, but I think we have responded to those questions.

And I'll defer to the staff in terms of

whether or not they are satisfied with our answers, but they did answer. There were several questions generated in regards to that special population.

CHAIRMAN POWERS: And your evacuation time estimates, how were those done?

MR. AMUNDSON: How were they done?

CHAIRMAN POWERS: Yes, sir.

MR. AMUNDSON: Well, we used a contractor. And they have an established model and methodology that they use. That model and methodology were reviewed by the staff. And I am not an expert in terms of the details of how that model works.

CHAIRMAN POWERS: The operative thing is that you didn't do it?

MR. AMUNDSON: Right.

CHAIRMAN POWERS: You got a contractor to do it?

MR. AMUNDSON: That is correct.

CHAIRMAN POWERS: You ran one of the standard codes, got an answer?

MR. AMUNDSON: Yes.

CHAIRMAN POWERS: Everybody was happy with the answer?

MR. AMUNDSON: Well, some of the issues

are still under review by the staff. So, again, I'll defer to the staff in terms of their satisfaction with the answers that we provided to their questions.

A couple of areas that we did emphasize during the planning and development of the new emergency plan, as we have already talked about, we did perform a new evacuation time estimate study.

The previous study had been done in support of the original Vogtle 1 and 2 effort. It was time to update that study. And so we performed a new study that is applicable to both units 3 and 4 as well as units 1 and 2.

The results of that study, though, were that we found that the results were very consistent with the original study that was conducted. We did not really have to modify, for an example, evacuation routes. We did not have to modify control points.

We have provided that study to the state and local agencies that are responsible for implementing evacuations. And they have determined that there really was no need to change their existing plants.

Another feature of our approach was to use the existing emergency planning zones, both the plume

exposure pathway and the ingestion pathway zones, are the same, as we have for Vogtle 1 and 2, took a look in terms of whether or not there were any new impediments.

We did not identify any new impediments to emergency planning and, looking at the proposed results for potential releases from the site, determined that the existing planning zones were adequate for purposes of emergency planning for the new units.

CHAIRMAN POWERS: You are again a fairly free of the complications of a large Western and transient population in this?

MR. AMUNDSON: That's correct. The permanent population is relatively small. I think the permanent population, for emergency planning purposes anyway, was estimated for 2006 to be a little over 3,000 and will remain under 4,000 projecting forward to 2010.

The major consideration, really, from evacuation time estimate studies, really, for us is the construction workforce that would be associated with units 3 and 4.

In any case, low permanent population;

very few industrial facilities; and, of course, on the South Carolina side, the Savannah River site, which we have addressed through separate agreements with them.

CHAIRMAN POWERS: Well, yes. What I was very interested in was the treatment of transient and tourist recreational.

MR. AMUNDSON: Right.

CHAIRMAN POWERS: But you just don't have any. I mean, I think you estimated an average of 50 hunters or something like that.

MR. AMUNDSON: Yes. I think it looks like, for example, there is a wildlife management area within the area. We went and talked to DNR. The total usage over the whole, say, hunting season is on the order of 190 people. So on any given day, we assume probably 50 in the area.

CHAIRMAN POWERS: Numbers on that order so that it's just not a significant finding element.

MR. AMUNDSON: It's relatively easy compared to other sites.

CHAIRMAN POWERS: You have a great in in there that says that the facility is adequately posted with information on what to do.

MR. AMUNDSON: Correct.

CHAIRMAN POWERS: What does "adequately posted" mean?

MR. AMUNDSON: Chris, do you want to describe what kind of postings we've got?

MR. BOONE: Yes. We do have specific postings where the siren locations are mainly. Providing instructions to transient populations, the hunters, the folks just coming through the area, that give them instructions on which radio station to turn to and what they're expected to do. You know, it's pretty standard fare.

Those postings are throughout the emergency planning zone on a fairly large scale but typically at all of the siren locations.

CHAIRMAN POWERS: I'm just going to have to come look one of these days, but, I mean, you're just fortunate you just don't have that complication that some of the sites do.

MR. PIERCE: We'll be glad to give you a tour.

MEMBER MAYNARD: You say that you're using the existing EOF and incorporating common TSC for all units. Are you building a new TSC or --

MR. AMUNDSON: We are.

MEMBER MAYNARD: Okay. Now, personnel involved in the emergency plan, is it the same people for the new units that would be for the existing plan, existing units, or different people be involved?

MR. AMUNDSON: Well, certainly the emergency response organization will be developed for units 3 and 4 as we develop the staff or we put the staff in place. We will be selecting that staff as we go along.

And obviously some of that staff may come from units 1 and 2. Some may not. But, in any case, they all have to go through our training programs.

MEMBER MAYNARD: Are you envisioning for an emergency in the new units people that would be staffing these facilities? Would it be different people than if they came up with the existing units?

MR. AMUNDSON: Well, our intent would be that, for an example, the emergency director would be qualified to handle any emergency at any unit. It will be a site emergency director.

There will be appropriate level -- it will depend on the kind of issue that you're dealing with. For an example, the engineering technical staff, there will be similarities between the design, but

there will be some differences.

So we will make sure that the people if they are qualified for all four units, they have been trained on the appropriate technical differences. For an example, the emergency action levels will be similar but not exactly the same between the two designs. So there will have to be some special training if you're qualified to classify the event, for an example.

MEMBER MAYNARD: Okay. Where I'm leading to in the next question, then, is if you were to have an issue that affected both the existing units and the new units, the plan and the facilities adequate for whatever staffing that you would need to be able to handle both simultaneously.

MR. AMUNDSON: Yes. It's correct. It will be large enough to handle that. It's got plenty of space to do that. It will have obviously the inputs into it.

Just as our EOF in Birmingham is currently capable of dealing with issues from three different sites throughout the unit, now we're adding two reactors to one site. And so that will be an additional input into that facility.

MEMBER MAYNARD: And that certainly makes it easier on the local governments and stuff if there's just the one facility, rather than --

MR. AMUNDSON: That's a key consideration, one set of telephones that they have to deal with and so on. They know where to go.

Just to kind of continue, we have already touched on this, but certainly we did take the existing plan, basically modify it into incorporate the features from two more units and ultimately will make that the emergency plan for all four units at the site.

We are planning to incorporate a common and build a new TSC that will incorporate all units. And we do plan to use the existing emergency off-site facility, which is all located in Birmingham, Alabama.

A couple of features just to kind of get a feeling for it. First of all, I just want to point out, this will be the location of the new technical support center. We have just a general conceptual layout drawing also on this figure. Actually, with the latest designs, it may become a little bit more square in shape than shown here. But essentially it will have at least this size and this general layout.

In terms of the protected area, right now, of course, the protected area includes just units 1 and 2. About a year before fuel load for unit 3, we will take the protected area and expand it to include unit 3. And that's about the time we will put the technical support center into operation for all three units.

There will be some details on that transition plan and how we make that work for units 1 and 2 and when we actually cut it over for units 1 and 2, but we will work out those details later.

Conceptually, then, about a year later, we will expand the protected area to include unit 4. And then we will have all four units being covered by the technical support center.

I just threw this slide in just to point out a couple of the areas from an emergency planning perspective. We have already talked about this to some degree, but, of course, here is the Savannah River site. And I have another slide that will show how much of that is really in the ten-mile EPZ.

Again, in terms of the ten-mile EPZ, they are virtually a no-population center. This little village of Gerard, although it shows a large physical

area, is within the ten-mile EPZ, but it has a population, really, of about 200-250 people, something like that. So it is a relatively small village. That is the only population area within the ten-mile EPZ.

The county seat for Burke County is Waynesboro. It's located on about 15 miles. So it's about five miles outside of the zone. And it contains the reception center at a high school. It's the Burke County high school, basically. It's a reception center if we evacuate the ten-mile EPZ.

And then there's a little bit over here in Aiken County that's in the ten-mile EPZ, a little bit down here in Barnwell and Allendale Counties. And those respective reception centers are up here in Aiken and over here between Allendale and Fairfax.

There's a high school here located between these two towns of Allendale and Fairfax. That's one of the reception centers. There's another school up here in Aiken that's also a reception center.

And, finally, I just wanted to share and show a little bit about the ten-mile exposure emergency pathway zone just to give a little bit of a feeling for the geopolitical boundaries that we have established.

And I wanted to point out also in terms of planning the Savannah River site shares in their planning. For an example, they use foxtrot 5, delta 5, charlie 5, bravo 5, and bravo 10 in their emergency planning zone also, also involve canon hotel 10. Those emergency sites are common or those geopolitical boundaries are common for the emergency plans for both Savannah River site and for the Vogtle site.

That's my last slide. Any questions?

MR. PIERCE: I think that concludes what we had planned to provide this morning.

CHAIRMAN POWERS: I would like to come back and discuss a little bit more about the Wilson fossil fuel units on the site and how they figure into the LOCA hazards of the facility. These are oil-fired units. Is that correct?

MR. DAVIS: Yes, that's correct.

CHAIRMAN POWERS: And how do they receive their fuel oil?

MR. DAVIS: Tanker truck.

CHAIRMAN POWERS: Tanker truck. A lot of truck.

(Laughter.)

MR. DAVIS: Yes. And that was evaluated

as part of our hazard analysis.

CHAIRMAN POWERS: I noticed that you didn't discuss it in your oral presentation at all.

MR. DAVIS: No, I did not mention that, but our analysis shows that a hazard is within the limits. So do you all want to elaborate on that any? Dan?

MR. PATTON: That was it.

(Laughter.)

MR. DAVIS: There's a large volume there, but it's not really an issue for Vogtle 1 and 2. And 3 and 4 are going to be even further away. I mean, it's analyzed for 1 and 2. It wasn't an issue.

And 3 and 4 is even further away from Wilson. Wilson is on the east side of units 1 and 2, and 3 and 4 are on the west side of 1 and 2.

CHAIRMAN POWERS: The inventory of fuel.

MR. DAVIS: Yes. I don't know the total volume. Tom?

MR. MOORER: Three tanks, three million each.

CHAIRMAN POWERS: Roughly ten million.

MR. MOORER: Well, nine million is normally the inventory that's there.

MR. FISCHER: Could you identify yourself for the --

MR. MOORER: I'm sorry. Tom Moorer, Southern Nuclear.

CHAIRMAN POWERS: And accidental combustion event.

MR. DAVIS: I'll defer to technical people over here at Bechtel.

CHAIRMAN POWERS: Tank fire. What does tank fire do to you?

MR. PIERCE: Go ahead.

MR. PATTON: Certainly the combustion products would be detected by smoke detectors and --

CHAIRMAN POWERS: Detectable, yes.

MR. PATTON: So as far as toxicity of just the spill, it's a low vapor pressure material. So that's not an issue. This would only be from accidental fire. And the evaluation is that the control room would be protected by smoke detection and the HVAC system.

CHAIRMAN POWERS: Yes, but doesn't it pose a constraint on your design of filtration systems for your control room? The fire puts out just a God awful amount of smoke. And I don't know that most of the

roughing filters I have seen in front of the filtered intake to a control room could handle remaining gallons for a tank fire burning given that the flow of the wind was such that it -- you know, the worst possible flow of the wind.

I mean, isn't that a constraint that ought to appear in this thinking about this design or is that something that we defer to the COL?

MR. DAVIS: Yes. I mean, it was evaluated. The impact to the control room was evaluated and determined not to be an issue. So I wasn't --

CHAIRMAN POWERS: It's fairly glib in the document. If we have a burn and we have a fire, it's okay. I mean, that's what the document says.

MR. DAVIS: We did have questions from the staff on that. And they evaluated. And I guess we'll defer to them if they feel like, you know, what we had was adequate or not.

MEMBER MAYNARD: I think it would have to be evaluated at both stages, you know, something to do with the early site permit. But it would definitely have to be addressed I think at the COL for the design for whatever hazards exist there, too.

CHAIRMAN POWERS: Well, you know, in a document this size, it's always possible to miss something, but as far as I can tell, let's say there is a burn around the tank. That's fairly incomplete examination.

I mean, a tank fire is not an uncommon event. And the ones that I've seen, they're smokey fires. I don't think you need smoke detectors to detect the smoke.

(Laughter.)

MR. PIERCE: But I do believe that that is more of a combined operating license application issue and would be looked at in the application. Is that right, Amy?

MS. AUGHTMAN: This is Amy Aughtman from Southern Nuclear. I'm the COL licensing lead. I was going to look to Dan or Bob to see if that was on our list of items to address. I don't believe it's an action item from the SER at this point.

MR. PRUNTY: This is Bob Prunty. We did have somewhat the advantage of these tanks already having been there in the proximity of two existing units.

And so our analysis for 3 and 4 used as a

starting point the existing analysis that was there already. That's probably why there's not quite as much treatment in there in that we didn't have to do this from scratch.

We looked at the existing plant analyses and evaluated them as to whether or not they were suitable and reached the same conclusions for the new units. And we did reach those conclusions that the analytical work done for the present two units could be extracted to that of the new proposed units.

I don't remember the details of that analysis off the top of my head, but the reference is to that. And you may not see as much individual analytical detail in there because of that.

We do not have a detailed HVAC design right now --

CHAIRMAN POWERS: Sure.

MR. PRUNTY: -- to evaluate this. So we had to do it in kind of an enveloping fashion.

CHAIRMAN POWERS: I was just looking for a constraint on that HVAC design coming from that smoke. And some of it comes from the forest fire smoke. And I just didn't find it. Okay. The COL has got to worry about that sort of thing.

MR. ARAGUAS: This is Christian Araguas, staff.

I did want to mention and clarify that is something that we determined is a review that's done at the COL stage. But the identification of the event and specifics of the event are what should be reviewed at the ESP stage.

CHAIRMAN POWERS: Okay. Well, tank fire was one that came immediately to my mind. What else can this unit do, the Wilson unit do, to your nuclear power plants?

MR. DAVIS: I'll defer to -- I mean, we do use it as part of off-site power source. Chris, can you say anything to that?

MR. BOONE: No. In the existing plant is a capable off-site power source for the existing units. As far as from the hazard point of view, though, I don't think I have anything else to add.

CHAIRMAN POWERS: Okay. Do members have any other question on the applicant's presentation here? We're going to get to hear more and go into some of the -- I mean, we have skirted the geological and seismic issues, which usually occupy rapt attention for hours here and whatnot.

I'm sure we'll be going through more utly limestones and Blue Bluff Marls. And I know there's at least one sediment layer that we're definitely going to discuss at some length.

But on this overview presentation, any questions?

(No response.)

CHAIRMAN POWERS: Okay. Let's take a break until 10:30. And we'll get a presentation from the staff. Thank you.

(Whereupon, the foregoing matter went off the record at 10:18 a.m. and went back on the record at 10:34 a.m.)

CHAIRMAN POWERS: Let's come into session here. Let's come back into session. We will begin the staff presentation. And, Nilesh, we will begin with you.

III. NRC PRESENTATION

- STATUS AND OVERVIEW

MR. CHOKSHI: I will be brief in my comments because I think we are looking forward to getting the Committee's perspective on the issues we have currently open and also other issues the Committee identified.

With that, I think we are really looking forward to this discussion and then with the full Committee after the Subcommittee gives us its guidance.

Thank you.

CHAIRMAN POWERS: Thank you.

Question?

MR. ARAGUAS: Yes. My name is Christian Araguas. I am the safety project manager in charge of the review of the early site permit application from Southern Nuclear, the Vogtle site.

I just want to briefly go over the purpose that we intend to cover today, and that is to brief the Committee on the status of the staff's safety evaluation report and on the Vogtle early site permit; and, of course, to support the Subcommittee's review of the application and subsequent interim letter from the ACRS to the Commission; and, lastly, to address any questions that you guys have.

Next slide. In other to do this --

CHAIRMAN POWERS: I hate to interrupt you. I hope you will also help us with the issues of lessons learned. And one of those issues that had come up in the past is the use of internet data. And

so I hope you will be able to address that during the course of your presentation.

MR. ARAGUAS: I do have a slide for that presentation.

CHAIRMAN POWERS: Okay.

MR. ARAGUAS: Okay. So, just looking at the meeting agenda, a couple of bullets that we had laid out here, what I had planned to talk about. First, I was just going to lay out the basic schedule milestones about what we have already accomplished and what is remaining in this review. And then I am going to highlight some of the key aspects of the Vogtle ESP application. And then we will dive into the key review areas and touch on some of the open items that the staff thought were important to mention in this meeting.

In the afternoon, we will follow with the review of the geology, seismology, and geotechnical engineering of the site as well as the radiological consequences of design basis accidents.

And following that -- and I would offer this to the ACRS -- I had initially intended to go through the staff's safety conclusions as a part of this presentation, but I looked at the agenda and saw

that there was some time at the end. So I don't know if we can play it by ear as far as what we want to do, either cover it now or wait until the end depending on time.

CHAIRMAN POWERS: Yes. I think you would probably be able to cover the conclusions better if we put it according to the agenda because there may be things that come up here in the course of this discussion that you will want to address.

MR. ARAGUAS: Okay. And following the conclusions, I will go over just general presentation conclusions. And then we will open it up to discussion.

- UPCOMING MILESTONES

MR. ARAGUAS: Okay. So completed milestones. We received the application August 15th of last year. And we completed the acceptance review on September 19th of that same year.

Following that, we had several audits/inspection. Our first inspection actually occurred during the acceptance review. And that was with respect to the quality assurance.

Next we had a brief site visit, not necessarily an audit but just a visit, kind of get an

understanding of the layout with respect to emergency planning. And that was in October. And then we followed with in November an audit of the hazard and security of the site. And we looked at meteorology in December. And in January, we followed with hydrology, geology, and we had our health physics personnel out there looking at the normal doses.

Next, RAIs were issued March 15th of this year. And then recently we just issued the SER with open items on August 30th. And more recently we just received the responses to the open items on the 15th of this month. So the staff just began a review on those open items.

- SCHEDULE

MR. ARAGUAS: Next slide. For many milestones, we have, of course, the full Committee meeting next week, on the 1st. And then we anticipate the interim letter sometime within that month. And then following that, our next opportunity to meet would be based on the advanced SER with no open items, which is due out to the ACRS on May 16th of 2008.

I want to touch on that just because I know the language is a little bit different than what we called it for the previous three ESPs. But what we

are doing now, instead of going straight to the FSER and then coming to ACRS to discuss that final SER, we determined it would be better just to have an advance copy that's not final and then address ACRS' comments and then go from there final. So that's what that's called.

And then we go to the ACRS Committee sometime in June, which we haven't scheduled yet, but we plan to do that based on as long as we keep track to the current review schedule.

And then, following that full Committee meeting, we would anticipate the letter sometime in July of 2008 and anticipate the SER to be issued August 6th of 2008. And, following, we would have the mandatory hearing sometime in the spring and then the Commission decision assumed sometime Summer of 2009.

Next two slides I will just briefly go over. I just wanted to highlight who the principal contributors were, including the contractors, pretty much the same group of people with the exception of some new hires we have had supporting these reviews and training so that we're prepared to address the influx of applications coming in within the next few months.

As far as contractors, we had Pacific Northeast National Laboratories. And then, of course, for the emergency planning review, we had FEMA and PNNL. And then one of the other contractors was Brookhaven National Lab. And then, of course, we had U.S. Geological Survey.

- DSER REVIEW

MR. ARAGUAS: Okay. Now I wanted to touch on just some of the high-level aspects of the ESP application. And Jim Davis covered this. So I will try and go as quickly as I can through these slides so we get to the meat of the presentation.

The proposed site is located in eastern Burke County. And it's approximately 26 miles southeast of Augusta, Georgia. And it's adjacent to and west of existing units 1 and 2.

The ESP applicant is Southern Nuclear Operating Company. And they submitted the application on behalf of its four owners, those being Georgia Power Company; Oglethorpe Power Corporation; Municipal Electric Authority of Georgia; and the City of Dalton, Georgia.

The application for the ESP is for two additional reactors. And those Southern Nuclear, next

slide, reference the Westinghouse AP1000-certified design in its application.

The permit request is for a 20-year term. And Southern Nuclear is seeking approval for limited work authorization activities, those being the LWA-1 type and LWA-2.

And something unique to this submittal, as mentioned previously, was the fact that, unlike the previous three ESPs that submitted major features, Southern Nuclear has provided us with complete and integrated emergency plan with ITAAC for review.

I did want to highlight the LWA aspect of the application briefly. We received the LWA-1 request as part of the original submittal in August. And that was to cover site preparation activities, such as excavation for facility structures, construction of service facilities, installation of temporary construction, support facilities, and then construction or expansion of non-safety-related SSEs.

The LWA-2 request we recently received in August, August 16th, of this year. And it's I don't want to say a significant impact, but it has certainly added a few review areas that we purposely don't do for ESPs. So we did have to extend the schedule out

for that review as far as issuance of the FSAR, but we are anticipating a minimal impact on the overall schedule of ESP issuance.

Having said that, they submitted the LWA-2 request, which the staff is currently reviewing. And that is for placement of the engineered backfill, including retaining walls, preparation of nuclear island foundations.

And with that, we received information with respect to SRP sections 2.54; 3.85, which is new to the application; and then with respect to 17.5, the aspects of the QA with respect to these construction activities that were identified as part of the LWA-2 request.

And, lastly, which is also not typically submitted for an early site permit application, is the fitness for duty for construction activities.

CHAIRMAN POWERS: These LWA-2 activities would commence when?

MR. ARAGUAS: I don't know if I can answer that. I don't know if someone wants to answer that. I know the LWA-1 is expected sometime in January of '09. I don't know. Jim, did you want to jump in and talk about when you plan on doing that?

MR. PIERCE: This is Chuck Pierce, Southern Nuclear.

The LWA-1 work we would expect to actually begin now, prior to the completion of the ESP, because of the new regulations out there in early '09. And the LWA-2 work, which is safety-related work, we would start almost immediately under our current schedule, after we receive the ESP sometime in mid '09 to late '09.

MR. ARAGUAS: Does that answer your question?

CHAIRMAN POWERS: Yes. What it does is it puts a premium on grain with a depth of backfill that's needed and the kind of backfill that's needed here.

MR. ARAGUAS: Right. And I do want to mention that is one of the things that we'll discuss as part of the full Committee meeting. Currently right now we are just starting the review of the LWA information for LWA-2.

And, to clarify what Chuck said as far as the LWA-1, currently the LWA rule, new rule, has gone out. So their intent is to review their application and meet the intent of the new rule, which would allow

them to begin those LWA-1 activities without prior approval from the staff.

CHAIRMAN POWERS: And none of this is particularly unusual, too.

MR. ARAGUAS: Right. Okay. So jumping in to the key review areas, start off with section 2.1. And that's the geography and tomography of the site. Staff looked at, in particular, the site location and description, particularly at the coordinates for the site, identifying the site boundaries an the orientation of principal plant structures, locations of highways, railroads, and waterways that traverse the exclusion area. And, just to point out, none of those actually traverse the site EAB.

Next we looked at the exclusion area authority and control. In this case, it was identified that Southern Nuclear does have full control or the authority with respect to the exclusion area and controlled activities within the exclusion area.

They identified two activities that occur on site that are unrelated to plant operation. Those were with respect to the visitor center and activities under plant Wilson.

Looking at the population distribution, the staff looked at current and future population projections, characteristics of the LPZ, and the population center distance and population density. The closest population center identified was naturally Augusta, which is approximately 26 miles away.

CHAIRMAN POWERS: The license you used, current Census and growth, previous Census and just extrapolated it forward to get a population growth out to 2070?

MR. ARAGUAS: Right.

CHAIRMAN POWERS: I mean, it's certainly a plausible approach given that there's no other definitive evidence.

MR. ARAGUAS: Right.

CHAIRMAN POWERS: In previous applications, we have actually university studies and whatnot to supplement those sorts of things. Is there anything to supplement that kind of information?

MR. ARAGUAS: I don't know. Rao, did you want to address that? Be sure to say your name.

MR. TAMMARA: Yes. My name is Rao Tammara. The applicant said that they have taken the 1980 to 2000 operation growth by county. And they

have predicted populations in the future until 2070.

So as an independent check, we went to the Census Bureau's data, 1980 and 2000. And we looked at the 50-mile counties and the portion of those counties within the 50 miles. And then we predicted from the 2000 what would be the estimated 2000 data compared to what it has been presented.

So we came up very closely within two percent. So that will stage of what fraction of the county was within the 50 miles. And, similarly, we have taken the 1980 to 2000 and taken that projection linearally and that growth rate.

And we applied and looked at it to the same years and compared the applicant's data. And we were very reasonable. So that is how we independently --

CHAIRMAN POWERS: What you're telling me is they did their arithmetic correctly.

MR. TAMMARA: Well, they did it more precisely than we did because we have taken the counting basis, whereas, they have taken the Census block basis, which is more rigorous than our analysis.

But we predicated within the reasonable limits. And we assumed the projections are reasonably

acceptable or accurate.

CHAIRMAN POWERS: You philosophically approached it the same way they did. I am reminded of the Clinton application, where they found that the populations in small towns in the vicinity of the plant would actually go down over the prescribed period and, whereas, the larger population centers would go up. And they did that based on some studies that have been conducted by universities in the region.

MR. TAMMARA: Right, right. I agree.

CHAIRMAN POWERS: And what I'm asking is, did we have any such additional studies, like by universities, that would supplement this and might have approached it in a different fashion to see if we come up with roughly the same results?

I mean, 100 percent accuracy I don't think we're asking for. Fifty percent accuracy on 2070 would be stunning.

MR. TAMMARA: But the point is for the chapter 2, the main emphasis of the requirements is to look at what is the projected density within the 20 miles.

So the precise calculation of one county

going up a little bit and county going -- I mean, might there be a cost-effective type of thing; whereas, for the environmental side, where they really look at the environmental justice and those things, the calculation probably had to be more precise than the chapter 2 addressing.

So I did not look into that detail. But I more precisely looked at it from the point of whether the density calculation is done correctly and the projections are reasonably accurate.

So to answer your question, that satisfied the chapter 2 requirements. Therefore, I limited my analysis to that and concluded on that basis independent analysis basis. And the predicted population is much lower than 500. Therefore, it did not warrant me to go into more rigorous analysis.

MR. ARAGUAS: Did that meet the mark?

CHAIRMAN POWERS: Well, it precipitated --

MR. ARAGUAS: Did it address your concern?

(Laughter.)

CHAIRMAN POWERS: It made me write down a note, if that's what you're asking. It might appear in a draft position.

MR. ARAGUAS: Okay. We can jump to the

next slide. We're on 2.2. The staff next looked at the nearby industrial transportation, military facilities.

The purpose here was to identify the potential hazards from the site vicinity obviously for the next section, which is where we evaluate the potential evaluation of potential accidents due to these hazards.

So with respect to that, we looked at the maps of the site and the nearby significant facilities and transportation routes, looked at the description of facilities, products, materials, and number of people employed.

And we looked at the description of pipelines with respect to how far away, what kind of materials are traveling down this pipeline or have the potential of going down those pipelines, what highways are nearby the site, and any waterways that are nearby the site, -- of course, the only waterway of significance was the Savannah River -- looked at any railroads and airports. With respect to airports, there were two airports.

There was the Burke County Airport, which I think was about 156 miles away; and then, more

importantly, the Bush Field Augusta Airport. I think it was 17 miles away. And then we looked at projections of industrial growth.

CHAIRMAN POWERS: One of the remarkable features about this site is that within a reasonable distance of the site up and down the Savannah River, there is nothing. There are no industrial activities.

I do have somewhere a proposal from the Savannah River site to develop hydrogen production capabilities and offering to feed that to an ammonia facility somewhere in the vicinity. Did you identify where that ammonia facility is?

MR. TAMMARA: We tried to contact Savannah River. And they said based upon the information, we did not come across the projections. And also it is a little further away from the plant also. It is about 17 miles. So based on that information and the distance, we did not really go into more detail.

CHAIRMAN POWERS: Yes. The ammonia facility would be outside the region that they would ordinarily do the planning, but it precipitates interest.

MR. ARAGUAS: Right.

CHAIRMAN POWERS: And, in fact, when we

talk about transport, we will talk about transport down a river valley. And, boy, ammonia loves to be there.

MR. ARAGUAS: Okay. We can jump to the next slide. Also in section 2.2, as I stated, we looked at the evaluation of potential accidents. With respect to this review, we are looking for any events that would be considered design basis events. And we define those as accidents that have a probability of occurrence on the order of magnitude of 10^{-7} per year greater and potential consequences of exceeding the 10 CFR 100 dose guidelines.

So, with that, we looked at four key areas. And that was explosions and flammable vapor clouds due to truck traffic, pipelines, mining facilities, waterway traffic, and railroad traffic.

With respect to truck traffic, I think the applicant identified that there were gasoline and fuel oil that were basically going down these highways. And the staff reviewed the applicant's analysis and determined that with respect to reg guide 1.191, that the critical distance was way outside what you would need to exceed the 1 psi over-pressure for the site.

With respect to pipelines, again, they

were I think, at a minimum, 19 miles away. It was the closest pipeline. And that was outside of the reg guide 1.170 limits, which you would consider they're within 10 miles.

For mining facilities, I don't think there were any mining facilities near the site. And then with waterway traffic, it was determined the Savannah River was not navigable.

CHAIRMAN POWERS: The issue really is the railroad. And we had a discussion on that. And the applicant says he went and asked the railroad, "What do you transmit up and down here?" And they gave him a list, and it didn't include chlorine, didn't include HCl, didn't include sulfur dioxide, which I thought was remarkable because typically those things get shipped around.

MR. ARAGUAS: Right.

CHAIRMAN POWERS: And especially sulfur dioxide, you would think that there -- I mean, you have got major chemical centers up north. You have got major SO_2 centers down south. Now, it may be that those things all take different routes --

MR. ARAGUAS: Right.

CHAIRMAN POWERS: -- and nothing comes up

there, but did you look at --

MR. ARAGUAS: Well, I know we didn't get the information directly from CSX, but I know the applicant had a little bit of trouble getting that information from them. So they had us contact CSX to have them release that information. So it's --

CHAIRMAN POWERS: It's as good as you're going to get.

MR. ARAGUAS: We're trusting the fact that CSX is telling Southern what is going on in these railroads.

CHAIRMAN POWERS: Where is the first railroad yard?

MR. TAMMARA: You said about eight?

MR. ARAGUAS: Distance-wise I think it was about --

MR. TAMMARA: Four and a half miles from --

CHAIRMAN POWERS: I want to know where I go to look at cars going by to see when my SO_2 tank comes by.

MR. ARAGUAS: Rao, what was your response?

MR. TAMMARA: We pretty much relied on the information provided.

CHAIRMAN POWERS: In that discussion, there's the discussion of CO. They call it asphyxiant. And it is. There's no question about it. But that's not the first thing that comes to mind when you think about carbon monoxide.

The balance of the discussion leads me to believe that it's a misprint. That should be CO_2. But I don't know that for a fact. Did you look into that at all?

MR. ARAGUAS: We didn't catch that either.

MR. TAMMARA: Yes, we didn't catch, but we looked at the major chemicals which are of importance that might have a Boehringer effect. So we concentrated on those. And we looked at those more closely: hydrogen and --

CHAIRMAN POWERS: The problem is the ones that they gave you won't. I mean, the railroad is too far away to cause any problems.

MR. ARAGUAS: And that's what we determined.

CHAIRMAN POWERS: Had they said, "Gee, we have an HF tank coming up here once a year," then you get a little more excited because HF does have good transport characteristics. SO_2 has good/bad transport

characteristics and things like that.

But none of the things that they quoted would you expect to, you know, if you had a major accident on the railroad involving multiple cars. And I noticed that they only took one car, I think, when they did their accident.

You still couldn't get it to transport to the site. But other chemicals will. I mean, that's --

MR. ARAGUAS: Right. I think, unfortunately, here we're at the mercy of CSX. And if they identify the chemicals, that's what we have to rely on.

I want to make a point I think it was 4.5 miles is the closest.

MR. TAMMARA: Yes.

CHAIRMAN POWERS: And I'm correct when I say that when they do the analysis, they only look at one car being damaged?

MR. ARAGUAS: Yes.

MR. TAMMARA: The total amount.

CHAIRMAN POWERS: The total amount from one car?

MR. TAMMARA: Yes, that's correct.

CHAIRMAN POWERS: Interesting.

MR. ARAGUAS: The next --

MR. TAMMARA: That has been for the cyclohexane. And for the other one, they have chosen 16 tons, I think, if I am correct, the other. That is the maximum amount there. Yes. Sixty-seven tons, 132 points, one rail car can hold. That is the maximum that has been analyzed for cyclohexane and 26 tons for the anhydrous ammonia.

MR. ARAGUAS: Okay. The next type of accident that we considered was the release of hazardous chemicals. And we looked with those with respect to transportation accidents, any major depots or storage areas or any on-site storage casks.

And with respect to the major depots, as we touched on earlier, we did look at an analysis that was done by Southern with respect to plant Wilson and, in particular, look at the fact that it was fuel oil that was being stored there.

We considered or we did an analysis where they -- or we confirmed their analysis or they did an analysis with respect to a tank that was carrying three million gallons of fuel oil and determined that the concentration of the toxicity limit with respect

to Reg Guide 1.78 would not be exceeded.

So that was the only thing with the effect of major depots that we looked at in storage areas. For on-site storage tanks, it was identified that hydrazone was stored at unit 1. The applicant provided us an analysis with respect to what was done for unit 1.

And it was determined again that it did not exceed the toxicity limits which were provided in Reg Guide 1.78. So they made the argument that since units 3 and 4 are further away from the tanks than what they are for units 1 and 2, it would be okay. And the staff found that to be acceptable.

We did identify a COL action item with respect to that issue just to verify at the COL stage what the impacts to the control room would be.

The next item we looked at was the transportation accidents. Again, as stated, we looked at the gasoline and fuel oil and determined that the Reg Guide 1.78 toxicity limits would not be exceeded.

CHAIRMAN POWERS: In our discussions on these issues, we discussed fuel tank fire and the smoke burden that the HVAC systems for a control room would be expected to handle. Did you look at that?

MR. TAMMARA: Yes. We looked at it from the toxicity concentration if the tank failed from the fire that -- since the control room design has to be finalized at this stage, COL stage, we put that as well as the chemicals for AP1000, whatever they listed out. Those two should be looked at the COL stage because of the lack of design of control room habit or the control room designs. So that we have identified and put to be looked at at the COL stage, those two items.

CHAIRMAN POWERS: Toxicity includes the particular burden?

MR. TAMMARA: Yes. The toxicity limit outside the control room has been calibrated. And that is much lower than the limit of 300. Therefore, based on the assumption, since outside concentration itself is acceptable, the inside probably is acceptable. That is the way --

CHAIRMAN POWERS: I'm not sure you're hearing me. I don't know of any roughing filter system for a control room that could tolerate three million gallon diesel power burn smoke concentration.

MR. TAMMARA: That's true. That I agree. That has to be looked at in the section 6.4 in the DC

OL stage because of the designs we will find at that stage.

MR. ARAGUAS: I think the point that he is trying to make is that you're right. It may not be handle that. It's something the COL applicant would have to address. You know, if it's not feasible, that is something they would have to consider and determine what the mitigative measures would be for that.

CHAIRMAN POWERS: Well, you can handle it. It's just a matter of how big you make your roughing system. And most of them they don't make big enough.

MEMBER ARMIJO: Isn't it being handled for units 1 and 2 already?

CHAIRMAN POWERS: I don't know.

MEMBER ARMIJO: They're there. It's there.

CHAIRMAN POWERS: I have no idea what they have done.

MR. ARAGUAS: Rao, did you -- units 1 and 2 with respect to --

MR. TAMMARA: From a small perspective, I did not take a look at that. From the concentrations, I mean, I look at their unit 1 calibrations. But they have revisited and recalibrated for units 3 and 4.

So the calculations they have made for the toxicity limit is a recent calculation because the problem with one of the things is for the unit 1 and 2, they have been done a long time ago.

And some of them, the applicant could not really trace back. And we had the audits. And we tried to look in their calculations because initially they were saying it is good for units 1 and 2.

Therefore, these are a far different area for these two. But we insisted that the calculations said how to be done and that have been performed.

From a small curve point of view, I did not take a look at it.

MR. ARAGUAS: So we didn't look at it, but we just looked at the stand-alone calculations for units 3 and 4.

MR. TAMMARA: Right, right.

CHAIRMAN POWERS: As in our discussion with the applicant, when it came to forest fires, he has a line in his application that says, "An analysis shows there's no problem there." But he provides me nothing else. Okay?

MR. ARAGUAS: Right.

CHAIRMAN POWERS: I mean, I didn't know

where to go to look.

MR. ARAGUAS: We did do an audit, as I mentioned, in November. And Rao can probably expand upon the review that was done.

MR. TAMMARA: Right. We looked at some of the calculations. And then the calculations were reasonable. I mean, I did not remember it was not, I mean, a contradictory area or whatever to expand on that one. But I looked at some of the calculations. Probably I should have, you know.

CHAIRMAN POWERS: Well, it's fairly remarkable because, I mean, if there's one thing that you notice about this site --

MR. TAMMARA: That's why we went --

CHAIRMAN POWERS: Trees. There are trees all over the place, isn't it? I mean, there are a lot of trees there. And so forest fire just comes to your mind. And it's remarkable to me that the application says an analysis in blank.

I mean, it's fine. And I'm sure it's right. And, similarly, the staff says, "Yes. We agree with their analysis." But, I mean, there's not even a hint as to what the magnitude of the effect is or what kinds of considerations are.

And I would think, gee, if I had to design something for this site, even though I would know that the forest fire is fine, I would sure like to know how it is impacting me in my design and heat loads, smoke loads, access problems, things like that.

MR. ARAGUAS: The last item because we just touched on fire, the last item that the staff looked at was radiological hazards and those associated with the Savannah River site and Vogtle units 1 and 2.

And the staff verified the information with respect to those. And basically what it states is there are measures in place to be able to detect any sort of hazards from those units. And staff found it to be acceptable.

Moving on to section 2.3, the staff looked at the meteorology of the site. And we looked at specifically the regional climatology, the local meteorology of the site, on-site meteorological measurement program, and the short-term atmospheric dispersion estimates for accident releases and the long-term dispersion estimates for routine releases.

Next slide.

CHAIRMAN POWERS: We're going to go into

these dispersion things in more detail later on?

MR. ARAGUAS: Yes, sure.

CHAIRMAN POWERS: I mean, it's difficult for me to understand how to treat this as a flat Earth site. I mean, I would think that the tendency for any dispersion under mild atmospheric turbulence conditions would be straight down the river and not in random directions and things like that.

And most computer codes you have can't account for the fact that the river channel is just a preferred site for dispersion and in this case probably music to your ears because there is nothing down that river.

Okay. We'll touch upon those.

MR. ARAGUAS: Okay.

CHAIRMAN POWERS: Let's get to the strange and the fun stuff here.

MR. ARAGUAS: All right. With respect to the review, the staff verified the applicant's proposed site characteristics. And those site characteristics that were identified were with respect to climatic extremes and severe weather and the atmospheric dispersion with respect to accident and routine releases.

So specifically, next slide, some of the site characteristics that we reviewed with respect to the climate world with respect to extreme wind, tornado, precipitation, and the ambient design temperature for generic and AP1000-specific.

And this was a little bit different than what was provided for the previous three. And this was due to the fact that they picked the design. And so when we talk about the AP1000-specific, what they're trying to do was to generate the site characteristics that correspond to those site parameters that were identified in the AP1000 design certification. So there was a clean match when we get to COL.

Next slide. Did you have any questions on those or did you want to go into any specifics with respect to the site characteristics or --

CHAIRMAN POWERS: Well, I did just glance ahead. And I am wondering where to raise my question because my question, as I am sure you can anticipate, is that we look at historical data to gather this information on what is the frequency of tornadoes, what is the frequency of high winds.

The site is not unduly influenced by

hurricanes except as a derivative matter, precipitation, and the fact that hurricanes generate tornadoes out in front of them.

We have reasonable evidence now that we are going through weather cycles on the Atlantic seaboard and that there are two cycles that affect that. And we seem to have those in phase now. And there is some evidence that certainly the frequency of hurricanes will go up.

There is legitimate academic debate on whether the frequency of intense hurricanes, usually labeled 4 or 5, magnitude 4 or 5, hurricanes, goes up in proportion to the increase in hurricanes or not.

And so that raises the question of looking at historical data, adequate to project forward for the next 70 years for this site.

MR. ARAGUAS: Hello. This is Joe Hoch. I don't know if you glanced enough ahead to what is an open item with respect to --

CHAIRMAN POWERS: Yes, I glanced far enough ahead.

MR. ARAGUAS: But to go into detail, I'm going to turn it over to the staff. Joe?

MR. HOCH: Hello. This is Joe Hoch, kind

of a new face. I know you are used to seeing Brad Harvey up here address this question all the time. I have been here about a year and a half. And this was basically the first thing I worked on when I came.

We take the idea of climate change, global warming seriously. And you'll see one of the lessons learned, which we are going to talk about later, is the issue of climate change in cycles.

CHAIRMAN POWERS: This has nothing to do with speculations about global warming.

MR. HOCH: Right.

CHAIRMAN POWERS: It has to do with the fact that we can track whether on the East Coast backed very reliably just about 17.50 and a little less accurately perhaps back to another 50 years. And when we do so, we see cycles.

I understand those cycles. One of them is affected by the El Nino cycle. Another one is affected by North Atlantic oscillation cycle. Those cycles have different periods, but every once in a while they come in phase. And we seem to be in a period where they're in phase.

MR. HOCH: Right. One effort I made here during this view was to look at long-term trends,

especially for hurricanes. There was no data, especially -- I can say this throughout the entire application -- there was no data that was ignored. If it was out there, I went and tried to find it and look at it.

For hurricanes, I went and looked at a 154-year period of record. It's kind of the accepted database from NOAA, National Oceanic and Atmospheric Administration, that puts out the record of hurricanes, looked at that. And I looked at the frequency and severity. And you don't see at this particular site.

We looked at a 100 nautical mile radius around the site. There's no indication of an increase at this particular site of an increase in severity or frequency.

I also considered the International Governmental Panel on Climate Change. We're trying to take a forward-looking approach, as just opposed to looking back. And although they comment on hurricanes and other climatic extremes, it's hard to quantify regional and local-scale projections out to maybe 2070.

So since we look at the extremes and take

the longest period of record we can, I think we are capturing these cycles of, you mentioned, 50 years. We're looking at a 154-year period.

And one other thing I would like to say is the applicant used DG1143, which is a draft regulatory guide, which uses a tornado wind speed of 300 miles an hour. And the staff is fairly confident, especially since this site is located away from the coast, that that 300-mile-an-hour wind speed will be bounty for any hurricane that may impact the site.

CHAIRMAN POWERS: Okay. That's enough.

MR. HOCH: Thank you.

MR. ARAGUAS: Okay. We jump to the next slide. The staff also looked at site characteristics associated with atmospheric dispersion, as I stated earlier.

We looked at the short-term dispersion estimates for accident releases, those at the exclusionary boundary and the low population zone. We looked at the long-term dispersion estimates for routine releases and those also at the exclusionary boundary, the nearest resident, nearest meat animal and nearest vegetable garden.

And, as I mentioned earlier, the staff did

identify an open item. And I'll just quickly read through it. It's provided justification for using a 30-year period of record from 1966 to 1995 to define the AP1000 maximum safety design temperatures. The staff believes these temperatures should be based on a 100-year return interval.

And the reason for this open item was the staff feels that the intent of the GDC2 is to identify the historical maximums. And we felt that the 30-year period was not as conservative as taking maybe the 100-year return, which would require some sort of normalization of the data and extrapolation.

So that was the point of view we were looking at it. And we have gotten a response in. And so we're currently reviewing that.

CHAIRMAN POWERS: At least orally in the presentation here, the applicant indicated that he had found some way to take 30-year data and get 100-year return out of it.

MR. HOCH: What was the question again?

CHAIRMAN POWERS: Comment. In the oral presentation here this morning, the applicant indicated that he had found a way to take 30-year data and utilize that to get 100-year --

MR. HOCH: Yes. The applicant used a linear approach interpolation to interpolate their data. They used a 30-year period. The staff went back and got even more data than the applicant provided.

I looked at hourly data from 1948 on to 2006 and came to a similar conclusion. I used all the data I possibly could. And there are also standards out there as far as determining 100-year return temperatures. ASHRAE, for example, puts out a standards that gives examples on how to calculate 100-year return period temperature.

CHAIRMAN POWERS: One of the things I discovered on the side is someone who is irritated with the National Weather Service, I take it, and has gone to the effort of showing mislocations of weather sites that are used. It's kind of a fun site to go through.

And, like I say, I can find his examples did not include any that affect this particular application. But I wondered, did you go look at those weather stations?

MR. HOCH: I did not specifically go to the stations. One question I guess I would have, too,

is, do you have a reference for this? I would like to look at it or maybe later.

CHAIRMAN POWERS: Not off my hand, but I found it completely by accident. I enjoyed it. It was fun. I mean, they have temperature-sensitive located to the outlets of air conditioner systems and things like that. So they all run hot.

MR. HOCH: Yes. What I tried to do is the applicant identified ten stations. I actually used 17. I used everything I could get. And those were kind of used just to identify the extremes.

One station that we did rely heavily on was Augusta, which is commonly referred to as a first order station, which the National Weather Service has a much higher QA standard for that kind of station.

CHAIRMAN POWERS: Good. Okay.

MR. ARAGUAS: Next slide. Now, the staff looked at the analysis provided under aircraft hazards, which is in section 3.5-1.26. And, again, we're trying to identify any design basis events. In this case, there's only one that was of concern, and that was with the airway V185. And that was in 1.5 miles.

I think the guidance says that you must

look at any airways that are within two miles of the site. And so the staff did look at that. They evaluated the applicant's analysis.

In this case, the applicant contacted the FAA but was not able to get the data for flights along that airway. So the approach they took was they back-calculated based on the 10^{-7} probability and determine how many flights would need to go down that airway to exceed this 10^{-7}. That was roughly 51,000 flights.

The staff did its own independent analysis and actually contacted the FAA on multiple occasions and was able to extract that data for flights down that airway and did its analysis. And, as Rao mentioned earlier, the probability that was determined was something around 6 times 10^{-7}. Is that correct?

MR. TAMMARA: That's correct.

MR. ARAGUAS: We felt that the approach the applicant took was conservative and, therefore, determined that it was okay.

CHAIRMAN POWERS: One of the issues that arises in looking at the applicant's analysis is the projection of how usage of Bush Field changes over the period and comparing that to the change in the

population density. And they don't seem to be in concert with each other.

Did you look at them?

MR. TAMMARA: Yes. As I answered previously, I looked at the table projections for Bush Field from 1990 to 2025. Initially they were very high, 47,000. And then they have gone down until 2009 and then started increasing from 2010 through 2025. And the projection for 2025 is 35,945.

However, when we make the analysis for the aircraft hazard, we look at the airports within five miles and beyond five miles and beyond ten miles and two miles and not only the airports but some airways.

So Bush Field actually falls around the 17 miles away from the site and based upon the guidance of the maximum flights should be higher than 1,000 times the distance squared.

So even if you count it that way and assume it is in relationship or in ratio with the population, however, you know, that assumption may not be realistic, but if we assume still it will fall under that criteria, so from the effect or potential effect point of view or the consideration point of view, it is lower, even if you assume.

But our basis was, you know, when you back-calculated and they say all the flights were assumed to go through that airway 185. Still we were under the projected number of 43,000. So that was their conclusion.

In addition, we went to FAA and looked at it more closely. Because that number of was very close to the 43,000, we were a little bit uncomfortable.

Therefore, we conducted FAA and got the precise number of flights passing through that airway. And they passed on to us. And it was about five years worth of data they supplied on the average. So we make the assumptions and then calculate the probability. And we assured ourselves.

So to answer you precisely, even if our assumption was taken into consideration, still the 1,000 times 17^2, 248,000 or whatever, even if you project 4 times the projected Bush Field flights, still it will be lower. So the concern can be looked at it that way.

CHAIRMAN POWERS: One question as long as you are looking at it. It seems to me that I definitely recall Bush Field being used as a training

field for Delta pilots. And look at that. Is that just a bad memory on my part? I mean, that is entirely possible.

MR. TAMMARA: But we looked at only the military as the training, military training routes and those things, but I did not look into that prospect.

CHAIRMAN POWERS: Please continue.

MR. ARAGUAS: So, as I said, the only concern that was identified was that airway. Now we can jump on to chapter 11. The staff looked at the dose for routine liquid and gaseous effluent releases.

As the applicant previously stated, this wasn't done for the previous applicants with the exception of North Anna. We did go back and ask for that information for North Anna and, therefore, asked for it for this application.

The staff performed the following review and analysis. We confirmed liquid and gaseous effluent releases. And we confirmed the appropriate exposure pathways.

We looked at the use of appropriate liquid dilution and atmospheric dispersion and deposition. We confirmed the use of appropriate land usage parameters. And we verified the applicant's

calculated doses using NRC-recommended models. And, lastly, we performed an independent dose assessment for liquid pathways showing the applicant's doses to be conservative.

The next slide. This table is just identified -- it's a comparison of the doses between what's allowed by the regulations, what the applicant's calculations yielded, and what the staff's calculations yielded.

CHAIRMAN POWERS: What motivated you to ask for this? You had asked for North Anna, but you didn't ask it for Clinton or Grand Gulf. I mean, just didn't like these guys and said, "We want you to work for more" or did like them and wanted more interaction with them or --

MR. ARAGUAS: I can't speak directly to what was done for North Anna and Clinton, why we didn't ask that information. I know for -- sorry -- for Clinton and Grand Gulf, but for North Anna, it was determined based on the regulations as specified in 52.17 -- Steve, you can correct me -- that our interpretation at the time was that, in fact, there was some sort of analysis to be done for liquid and gaseous effluents in terms of meeting criteria of

appendix I or 10 CFR 50, appendix I, and the part 20 limits.

I don't know if you want to elaborate on what, in particular, we needed, but --

MR. SCHAFFER: I'm Steve Schaffer with NRO's Health Physics Branch.

We were tossing this around while the earlier applications were going on. And, finally, we concluded with OGC that 10 CFR 52 really does require us to look at effluents, both the gaseous and liquid effluents, and look at their impacts.

It doesn't require us to compare them to the appendix B limits in 10 CFR 20, but it does require us to do the appendix I dose calculations.

CHAIRMAN POWERS: And you might want to correct your slide on ioiodine.

MR. ARAGUAS: And, as I was saying for the table here, this is just a comparison. You can see that the applicant's calculations were significantly less than what was identified in their regulatory limits.

Next we can move on to section 13.3, which is "Emergency Planning." As I mentioned, the applicant provided the staff with its first complete

and integrated emergency plan with ITAAC as submitted for an early site permit application.

As part of this complete and integrated plan, the staff is looking and Southern, we are looking at the agency certifications, making sure that any off-site, you know, the state and local organizations have coordinated with the applicant with respect to emergency plans for off-site response.

And the overall goal with complete and integrated plans is that the applicant achieves reasonable assurance, which means basically they have finality, in which case at COL there is no review left to do other than closing out the ITAAC that had been proposed.

Moving on to the next slide, the NRC's review in this effort is to review the on-site emergency plans. And that's done with respect to 10 CFR 50.47 and appendix C to part 50.

The applicable guidance that the staff used was NUREG-0654/FEMA-REP-1. This is revision 1. It also included the supplement 2, which is the guidance that was applied for early site permits.

As of recent due to the SRP updates and the fact that the Commission issued the SRM stating

that the appropriate guidance for emergency planning ITAAC, we looked at the SRP section 13.3 and a new table that was added to SRP with respect to what those generic EP ITAACs should look like.

FEMA is in charge of the off-site review. And their review is primarily done out of the Region IV office with coordination through their headquarters. And the applicable regulations are 44 CFR 350 and their radiological emergency program guidance.

And, of course, they share the same guidance that we follow, which is the NUREG-0654. And they also need to as part of their review verify that the exercise demonstrates adequacy of off-site procedures, which is proposed as an ITAAC.

CHAIRMAN POWERS: Did you look at the coordination of emergency plans between the Savannah River site and the global site?

MR. MUSICO: I'm sorry. What was the question? Who looked at the coordination of --

CHAIRMAN POWERS: Did you?

MR. MUSICO: Yes, I did. As a matter of fact, I made copies of the memorandum of agreement between Southern and Savannah River site. I thought

you showed an interest earlier. So I made a copy of it for you. And I'll give this to you whenever.

CHAIRMAN POWERS: Good. And what did you find?

MR. MUSICO: Well, we had a unique situation here in that we primarily concentrated on looking at the ten-mile emergency planning zone. What was unique about this site is that almost half of the entire ten-mile EPZ, which was in South Carolina, was encompassed by the Savannah River site.

I on a couple of occasions went down there and actually drove around the entire area, including through that site. It's very enlightening. You're not supposed to stop along the way. It's very controlled.

What we were faced with was a site that had an existing approved emergency plan. And we approached it with a presumption of adequacy of the existing plan in that we weren't reanalyzing every aspect of that which already exists. Again, there was a presumption of adequacy.

So in regard to the Savannah River site, essentially, in fact, we were looking at it kind of like a black box in that we did not peel the onion

down and analyze the Savannah River site's emergency plan that DOE would have.

However, we did look at the memorandum of agreement that was submitted as part of Southern's application, which provided a sufficient level of detail in regard to how they work with one another if there is an accident at either the Vogtle site or at the Savannah River site.

And, again, that's detailed in the five or six-page memorandum of agreement. And I have a copy here for you.

CHAIRMAN POWERS: Yes. I raise the question because I have looked -- I have pulled back the Savannah River site emergency plan in a different capacity. And I know that there is always the statement in there "Yes. And we coordinate with Vogtle." And we gloss over that, treat it as a black box, and say, "Yes. Nothing happens in Vogtle."

And so I was just wondering how it works when you go the other way.

PARTICIPANT: They are both black boxes.

CHAIRMAN POWERS: I mean, Savannah River has the feature of being somewhat experimental in its nature. And so you anticipate more events happening

there than at a licensed commercial facility. And so you tend not to look at it when you're working the DOE side of the --

MR. MUSICO: Right. Well, there are aspects that are different for each of the sites. For example, when I was down there for the first tour, I was told that after 9/11, the Savannah River or DOE put gunboats on the river. And there were helicopters -- I assume they were armed, I'm not sure -- flying around as well.

Now, I know Vogtle doesn't have that type of resources or the state that they would put into effect gunboats on the river. So there are differences between the two.

Now, there's another aspect, too. I didn't just depend upon the memorandum of agreement. What I was looking at, too, in driving through, I was impressed that with the closed nature of the facility, the high level of security, it is very closed, very secured, very controlled by the Department of Energy to the extent there was a heightened level of assurance that they could maintain the adequate level of protection and control over any personnel that were on those grounds.

So I gave them the benefit of that doubt without having to look at their individual plans, which I probably wouldn't have been able to see anyway, at least without higher clearance.

CHAIRMAN POWERS: Well, you know, I don't know.

MR. MUSICO: Again, that wasn't quite enough. I wasn't something substantive that I could base some sort of reasoned decision on, you know, why I said it was okay.

And the memorandum of agreement does provide a sufficient level of detail to show how the interfaces are controlled and when they are triggered. I think this will be helpful to you understanding that interface.

CHAIRMAN POWERS: That's good. Yes. It's just interesting. My recollection is the particular part of Savannah River that is most affected, but this is pretty vacant right now, vacant relative to what it was 20 years ago. It doesn't mean it will be in the future.

MR. MUSICO: Just to follow up, too, on a question you had earlier with respect to the postings, when I was down there, I took a picture.

CHAIRMAN POWERS: This is what I wanted to see. Excellent. I don't have to come visit now. Very nice.

PARTICIPANT: I have other pictures, too, by the way.

PARTICIPANT: Is that adequate?

CHAIRMAN POWERS: It looks like it's adequate to me.

MR. MUSICO: What caught my eye when I was driving around, I happened to see it. And I've been at a lot of sites in the past. This is the first site I have actually seen such a posting. So it caught my interest. And I happened to have my camera with me.

Having worked years ago, in the '80s, up at Seabrook, you would not see such a posting up there because someone would have an urge to test one of their chainsaws if they saw a sign such as that.

CHAIRMAN POWERS: In fact, in my handwritten notes on the applicant, I said, "I wonder how many bullet holes there are in these signs."

PARTICIPANT: It looks good.

CHAIRMAN POWERS: It looks good. It looks good.

MR. MUSICO: It looked adequate.

CHAIRMAN POWERS: Excellent.

MR. ARAGUAS: Can we jump to the next slide? I just put this slide here just so we can show who the off-site and state and local jurisdictions were. As you can see, it's the State of Georgia, Burke County, State of South Carolina, Aiken County, Allendale County, and Barnwell County.

CHAIRMAN POWERS: Somewhat off, jumping around a little bit just to help confuse you a little bit, there is a statement in the application that says, "Non-radiological emissions may be regulated by the State of Georgia." Shouldn't that be "will be regulated"?

MR. MUSICO: I'm not sure what you are referring to. By the way, I didn't identify myself. I am Bruce Musico with NSIR. I'm not sure what you are referring to, Dr. Powers.

CHAIRMAN POWERS: This is in the application. So you're not really responsible for it. It says, "Non-radiological emissions sources may be regulated by the State of Georgia."

MR. MUSICO: That would probably be more of an effluent aspect, rather than emergency planning aspect.

CHAIRMAN POWERS: Yes. It definitely is an effluent issue.

MR. ARAGUAS: Steve, did you want to address that? Do you know if the state -- Southern, do you guys want to address that?

CHAIRMAN POWERS: It's page 2.3.

MR. MOORER: The non-radiological effluents will be --

CHAIRMAN POWERS: It's "may" versus "will." It's page 2.3-26.

MR. MOORER: Okay. The non-radiological effluents will be addressed by an NPDES permit that's issued by the State of Georgia. They have primacy from EPA for that program.

CHAIRMAN POWERS: It's not "may." It's "will."

MR. MOORER: Will. Correct. And it's not just chemicals. It also includes the thermal effluent as well.

CHAIRMAN POWERS: Yes, yes.

MR. ARAGUAS: Okay. Next slide. For the review of the emergency plans, the applicant proposed inspection test analysis and substantive criteria for the aspects of the emergency planning ITAAC that

cannot reasonably be determined prior to construction of the plant. This was significant because, as I mentioned earlier, it is the first time that we have seen emergency planning ITAAC as part of the ESP.

And, again, this was the guidance was, directed as part of the SRM from the Commission, where it proposed or where it laid out the generic EP ITAAC that applicant should look at.

Again, NUREG-0800 was updated to incorporate that table of the generic ITAAC. And with respect to those generic ITAAC, the applicant in their review takes those and certainly turns them into the site-specific ITAAC.

CHAIRMAN POWERS: It just kind of adopts --

MR. ARAGUAS: Not directly but yes, informative to its site.

CHAIRMAN POWERS: Yes.

MR. ARAGUAS: One of the issues I wanted to touch on with respect to the ongoing review right now was the submission of the emergency action levels that the applicant has provided. These came in in March of this year. And the issue we have right now is currently there's a document in-house for review by

the staff. And that's NEI 99-01. And that's the guidance for emergency action levels for light water reactors.

You are probably wondering, well, why is that significant? We're talking about a passive reactor. Well, NEI 07-01 is also currently in-house. And that hinges upon the review for 99-01 because apparently there's a lot of overlap with the EALs.

Because of that, the staff's approach is that 99-01 needs to be completed before it can finalize its review of 07-01.

CHAIRMAN POWERS: The licensee certainly mentioned that he's going to have different action levels for two plants versus building two plants. So he is going to have to train his people to decide on these things.

MR. ARAGUAS: Right.

CHAIRMAN POWERS: His problem, I suppose.

(Laughter.)

CHAIRMAN POWERS: Don't care. His problem.

MR. ARAGUAS: The point I was driving at with this issue was that the problem we're having is that we can't approve these because Southern has

referenced that guidance document, which is in-house for review, which is NEI 07-01. So we're waiting for completion of that or endorsement of that guidance before we can embark in granting acceptability of those emergency action levels.

CHAIRMAN POWERS: So what do you do in the interim here?

MR. ARAGUAS: That's actually what we're discussing right now. Is there a way around this?

CHAIRMAN POWERS: Yes.

MR. ARAGUAS: A couple of options we have tossed around. And we haven't decided. Right now I think the endorsement of the document is set for March of this year. And we are still just debating whether or not the staff would be able to complete its review in a timely fashion to support the date that we have set, which is I think, as I mentioned, August 6th for the FSER.

There are other options, not that we have considered in detail, but we are still mulling over with our OGC the proposing of major features in the event that we can't complete the review in the timely fashion that Southern would like.

So that is sort of where we stand right

now. We haven't come to a position on which --

CHAIRMAN POWERS: I kind of hope you do because it would be a shame to hold things up for this. And my recollection on the pace at which these documents get reviewed is unpredictable and whatnot.

MR. ARAGUAS: That's the issue we're --

CHAIRMAN POWERS: I lack the competence to advise you on this matter. OGC is clearly the one to ask.

MR. ARAGUAS: And we can jump to the next slide.

- OPEN ITEMS

MR. ARAGUAS: And so that jumps me into the open items, as I mentioned on this previous slide. So we did have an open item for the review of the ALs. Mainly the goal here was just to identify that we can't complete our review. So there's not really an expectation for Southern to provide any response other than that it's currently being reviewed now.

The other open item that we felt was pertinent to discuss was 13.3-10. And that was discussed where the state and local agencies reviewed the new evacuation time estimate and provide comments and discuss the resolution of those comments.

And the reason this was significant, at least the staff thought it was significant, was that we wanted to make sure that they had coordinated with the off-site agencies just in the event that this new ETE might impact the off-site responses in some way.

CHAIRMAN POWERS: My perception is the estimated times for evacuation are probably reasonable. The documentation suffers some. Is that your perception?

MR. MUSICO: The documentation of the evacuation time estimates?

CHAIRMAN POWERS: Right.

MR. MUSICO: No, we didn't feel that. We had the evacuation time estimate study. The ETE was submitted with the application. This was a new ETE in support of this application. We had our contractor PNNL review the adequacy of this ETE.

They're specialists in that regard. They had also reviewed the ETE for the prior three early site permits. And a number of RAIs came about from their review and were addressed by the applicant. But we felt it was sufficient.

CHAIRMAN POWERS: Good.

MR. ARAGUAS: We're on to the next slide.

The next section staff looked at was 13.6, which is physical security. And the goal here is to determine whether site characteristics are such that adequate security plans and measures can be developed.

And consideration was taken for pedestrian and vehicular land approaches, railroad and water approaches, potential high ground adversary advantage areas, and the integrated response provisions and nearby road transportation routes.

The staff identified an existing rail spur at the site. And the applicant said the road and railroads that penetrated the required vehicle denial system will be provided with appropriate access control measures in accordance with existing regulations and the physical security plan that will be provided under the COL application. The staff did identify this as a COL action to follow up on.

Next slide. The last area the staff reviewed was chapter 17. That was with respect to the quality assurance measures applied to the early site permit application.

And so the staff conducted an inspection, as I mentioned earlier, August of 2006. And we reviewed the quality assurance manual, the plans and

implementing procedures of the applicant, major contractors, and we reviewed the data collection analysis and evaluation methodologies, including site characterization.

And our in-house review, which was completed January of this year, to support the issuance of the SER verified the applicant adequately applied the guidance in section 17.11 of RS-002 to demonstrate the integrity and reliability of data that were obtained during ESP activities.

CHAIRMAN POWERS: Tell us about the internet data.

MR. ARAGUAS: I knew that was coming.

(Laughter.)

CHAIRMAN POWERS: I'm too predictable, huh?

MR. ARAGUAS: I think the short response to that or short answer would be that we had previously reviewed Bechtel's measures for storing the internet data and felt confident they were applying the same controls this time around for Vogtle. And we had previously for North Anna determined that that was acceptable and so made the same argument for this review.

CHAIRMAN POWERS: Yes. How does this process work? I go to the site. I see the number is five. I take a screen shot on that. I store the screen shot. How do I know that some malicious high school kid hasn't come in and put in 5, instead of 100 that was there originally? I mean, at what point do I go back to the owner of that data and say, "Is this screen that I reviewed what you intended it to be?"

MR. ARAGUAS: Milton, do you have a --

MR. CONCEPCION: Yes. This is Milton Concepcion with the Office of New Reactors.

As we did with our previous early site permits, we verified that a process was in place to verify and validate the data that was used in support of safety features included in the safety analysis. And we verified samples of internet data that was used. And we verified that the process was implemented.

CHAIRMAN POWERS: But I don't know what "verified" means.

MR. CONCEPCION: Verification procedures were performed by engineering analysis or independent verifications or by certificates of validity from the source that provided the data. That was a process

that the applicant used to validate the information that was used.

CHAIRMAN POWERS: So he takes a screen shot. And then he goes and asks the agency that owns it, "Is this screen correct?"

And they say, "Yes."

MR. CONCEPCION: By independent verification, the process should yield a correct result.

MEMBER MAYNARD: Well, I didn't get the impression that's what they did, though. I didn't get the impression that they had gone back and gotten verification from the source, that they relied on the fact that it was an official government site, not going back and asking anybody, "Is that really the correct data?"

So I am getting a little bit different story maybe from what the staff is saying and what the -- I wouldn't have a problem if they went back to the National Weather Service or whatever and the National Weather Service provided something that said, "Yes, that is indeed our data." But I didn't get that from what the applicant was --

MR. CONCEPCION: Well, the verification

process was documented in procedures, the applicant's procedures. And we were able to verify that for a sample that we took during the inspection, that the data was validated by either independent verification or by a certificate of validation.

MEMBER ARMIJO: Who issued this certificate?

MR. CONCEPCION: The entity that provides the data on the internet. That is design control activity, I have to say. Once they get the data, the data has to be validated or independently verified.

MEMBER SHACK: And why do we get a different answer from Bechtel?

MR. PRUNTY: This is Bob Prunty.

The procedure as implemented calls for the independent validation of safety-related data, something that would be used in the safety-related design portion. And most of this site characteristic data doesn't really fall into that category.

CHAIRMAN POWERS: Okay. Now back to the answer to my question, what do you do about internet data? I mean, you've told me what you do about safety-related data. Tell me about site characterization data.

I mean, how do you know the trouble is -- I mean, I know sites where the local high school kids go in and change the numbers just for the fun of changing the numbers. And there is no reason to think people can't do that.

MR. CONCEPCION: Well, once you get the data from the internet from any source, in the case of Vogtle, what they did was they took the data. They printed it out and made it a record and included it in the project. And that data had to be verified and validated.

That is the process ascribed particularly for Vogtle. And we documented that in our inspection report. And we also documented a sample that we took to verify that the process was implemented.

MR. ARAGUAS: I think, Dana, this goes back to your point that was identified in the lessons learned we had last year, where we discussed internet data not having guidance developed to date. And I know to date there isn't guidance. So that may be something the staff might need to consider.

CHAIRMAN POWERS: Well, it appears that the staff has a position with respect to safety-related data. Here we're talking about things

that don't quite meet that requirement.

And the question is, do we need to have guidance for that data as well for these, particularly for ESPs and COLs? I mean, the COL embodies an ESP eventually.

MR. ARAGUAS: Right.

CHAIRMAN POWERS: Okay.

MR. ARAGUAS: I think the staff took the approach of what was done for the previous three ESPs, in which case those were found to be acceptable. And you guys bring up a valid point and something that we certainly should consider.

CHAIRMAN POWERS: Okay. Let's go on.

MR. ARAGUAS: Okay. The last point I wanted to make was that the applicant did provide an update to its quality assurance program or quality assurance plan, August of this year. And that was in support of the LWA-2 supplement that we received. Staff is currently reviewing that.

Next we will talk about hydrology. I will turn that over to PNNL.

CHAIRMAN POWERS: Let me just ask how long this particular discuss will go on.

MR. PRASAD: This is Rajiv Prasad from

PNNL.

Let's try to run through this quickly. I will try to finish it up in about five minutes.

CHAIRMAN POWERS: Okay. What time very likely to -- well, let's proceed again.

MR. PRASAD: Okay.

MR. ARAGUAS: Did you want to come up here so you can address their concerns?

MR. PRASAD: Okay. We can do that.

MR. ARAGUAS: You have the slides in front of you there, too.

MR. PRASAD: Okay. For hydrologic engineering, we have quite a few --

MR. ARAGUAS: Identify yourself.

MR. PRASAD: Rajiv Prasad from PNNL.

For hydrology, we have quite a few sections. Floods is the first topic which we address in 2, 3, 4, 5, 6, 7, and then 8. Nine is channel diversions, which typically relates to lower ratios but also flooding. Section 10 is flooding protection requirements.

Let's go to the next slide.

CHAIRMAN POWERS: When I look at the applicant's analysis, particularly dam failures, he

has three dams that he looks at and looks at sequential failure of them. And he says, "And everything is okay." He says, "I calculate the water heights," and I look at the wind, raising that water height up. And it's all less than his elevation.

And I'm sure he's right about that, but I have to go on his faith. What did you do to validate those arguments?

MR. PRASAD: What staff did in that case was we looked at the procedure that the applicant followed. And then we determined that the models and the data that they describe are reasonable.

The next thing that staff did was to look at a sensitivity aspect, from the sensitivity aspect, as to if we were to assume something more conservatively, a more severe failure of these dams, how would they affect the water surface elevation calculated at the site.

And staff looked at all of those and determined that even under more conservative assumptions, we were getting site flood elevations which were significantly below the site rate.

Let's go to the next slide. Eleven is low water. Twelve is groundwater use. And 13 relates to

radionuclide transport, release and transporting the groundwater.

Let's go to the next slide. 2.4.2 section deals with floods and what is the controlling flood. It also includes a site characterization and a site characteristic determination related to local intense precipitation.

Staff independently estimated local intense precipitation based on National Oceanic and Atmospheric Administration guidelines and used that as a site characteristic that will be used at the COL time for site grade design and site drainage design.

In section 2.4.3, we estimated, independently again, estimated PMF in the Savannah River basin based on NOAA guidance to estimate the probable maximum precipitation and then computed the flooding water surface elevation near the site. And they turned out to verify applicant's conclusion that potential dam failures that could result in the maximum, actually high floodwater elevation. So 2.4.3 PMF was not the bounding flood. And staff verified that independently.

In section 2.4.4, we looked at potential dam failures in the three dams that you were talking

about. And I just described that we verified applicant's analysis and carried out an independent sensitivity analysis, which also verified the conclusions that the applicant had.

In section 2.4.5, we look at probable maximum surge and seiche. There are no large bodies of water near the site that could sustain a seiche. So that was something that we immediately discounted. But the Savannah River estuary is subject to hurricanes.

We looked at historical data, again, from National Oceanic and Atmospheric Administration and looked at what sort of hurricanes we might get at the Savannah River estuary and if that hurricane were to utter what sort of backwater it could affect, backwater it will result in near the site.

We did a bounding calculation in terms of if the water level near the estuary was to raise by the maximum water surface elevation that could be caused by a severe hurricane, what sort of backwater effect would we see at the site? And it turned out that we again got bounded by the dam failure flood.

Section 2.4.6 deals with tsunami hazards. And this was something we sort of did based on

guidelines that are still in development. We looked at what sort of sources would we have that could cause a tsunami or a tsunami-like wave near the site.

The only water body that is near the site is the Savannah River itself. And it was not credible based on staff's review that any of the tsunami-causing mechanisms could cause a tsunami in the Savannah River that would reach the site.

We looked at the Atlantic River -- that is where the Savannah River estuary is -- and if there was a tsunami caused in the Atlantic Ocean that could reach the site or not. And based on, again, the bounding calculations, we determined that the site grade would not be exceeded based on a probable maximum tsunami that occurs in the --

CHAIRMAN POWERS: We have these people looking at the Cape Verdi Island --

MR. PRASAD: That's right.

CHAIRMAN POWERS: And postulating rogue tsunami waves based on land, essentially an underwater landslide and whatnot, that, at least in their extreme values, could get up to the 242 feet, whatnot. And staff has produced a document that says, "We don't believe that."

MR. PRASAD: That's right.

CHAIRMAN POWERS: But I don't see what it is. I mean, I don't quite understand. You've got two experts that say this thing can pose a tremendous hazard to the entire civilization of the East Coast. And you've got a bunch of other experts that say, "'t ain't so."

But I don't understand why they think it isn't so, the basis. The fundamental issue, it seems to me is what the low frequency dispersion is. And so how you decide what the low frequency dispersion is?

MR. PRASAD: I think it gets into very technical issues. And you are right. It gets into not only the dispersion effect. It also gets into the initial conditions that actually caused the slide, principally how quickly that slides happen. What is the underwater philosophy with which the slide moves?

Was the volume of the slide -- the one study that claims those catastrophic effects is really looking at half that island very quickly falling into the ocean and then continuing at a tremendous rate of speed into an underwater landslide.

That study if you take all of those assumptions in terms of initial failure and apply it

without any dispersion effects, that is what reaches the 25-meter flood height or 25-meter wave height that they're seeing off the course of Florida.

The objections raised in the community -- and that is coming from a lot of experts -- are saying that, first of all, even if they did verifying calculations to figure out if that was sustainable or not, if that was a credible situation or not, first of all, that volume and that volume falling at that rate of speed is probably not credible. That is one basis.

The second basis is actually those dispersion calculations. The equations, you have to use the correct equations. And the way the term is an intermediate wave and now a shallow wave that arises as a long wavelength wave that basically does not lose any energy during its travel through the ocean.

So based on those two assumptions, people are saying, the other camp is saying, that, well, the maximum wave run-up that we will be seeing or maximum wave heights that we will be seeing off the Eastern seaboard is close to a couple of meters, probably less than that.

Right now we do not know which one of these is correct, but we do have -- I think NRC

research has a contract with Pacific Marine Environmental Lab. They are the tsunami experts in terms of modeling, data collection, and warning issuance. And they are looking at it. And preliminary results from them also support the second assessment that we would not get catastrophic wave heights on the Eastern seaboard.

So it's a question of whether we can do refined calculations and how quickly we can do that.

CHAIRMAN POWERS: The next question that is raised by the Cape Verdi Islands -- what do you call it; a seaslide, I guess -- is okay. But yes, the Cape Verdi Islands are a long way away. I've got other troughs and other banks around that are closer. And so what are the frequencies with which they would produce seaslides that could launch tsunamis that would come up the Savannah River channel and perhaps affect the site?

MR. PRASAD: I think that there are some slides on the Eastern seaboard. And there is categorization being done by the USGS to look at these landslide failures. They are all submerged in the ocean. And then failure of those could cause a tsunami.

Typically these landslides are local in effect. So you would see if there is something off of the bank of, say, New Jersey. We would get a landslide-generated tsunami, but typically it will be limited in scope. And it's a special extent as to how far it travels.

Would it be able to cause a tsunami that runs up the Savannah River and reaches the Vogtle site? My assessment from what I know at this point, I would say no.

CHAIRMAN POWERS: And so you're making a probabilistic estimate there in some sense. What probability level are you thinking about?

MR. PRASAD: Well, right now we don't have a probabilistic estimate for tsunamis or there is not an accepted way to do tsunamis probabilistically. NRC research is looking into that. And we have USGS that has certain papers out, certain recent papers out, that lays out a way to do this.

The main limitation in my mind right with a probabilistic tsunami estimate is really the lack of data. We don't have a long enough record, long enough record, recorded history on the U.S. coastlines to go back and develop a probabilistic hazard assessment

methodology that would have really narrow levels of confidence. But in the future --

CHAIRMAN POWERS: You're the first probabilist that said that.

MR. PRASAD: But that's a fact. I can't walk away from that. I can't really claim that it can be done and it can be done with a very high level of confidence right now.

CHAIRMAN POWERS: It is pretty clear that Vogtle is less susceptible to this phenomenon. We can certainly identify plants that should they have early site permits, where it would become a more significant issue. And based on what I have seen going on in the research programs, staff is doing a pretty good job here trying to sort this out in a probabilistic fashion.

And so I congratulate you as part of that research group on what you are doing there because I do think we need to understand it a little better. It's novel. It's new. It's very strange. And we have limited experience with it, but we have got to get after it.

MR. PRASAD: Well, I think we have just the last five minutes, but I want to go through --

MR. ARAGUAS: Yes. What we can do is break.

CHAIRMAN POWERS: We can satisfactorily jump over things.

MR. ARAGUAS: What we'll do is we will cover the next --

CHAIRMAN POWERS: I have to tell my story of being in that --

MR. ARAGUAS: Just go over the open items. And then we can skip the tsunami section.

CHAIRMAN POWERS: -- at the Savannah River site. And one day it was snowing. And the guy on the radio says, "All you Yankees had better get off the road."

His partner on the radio said, "Well, why should the Yankees get off the road?"

He says, "Because we all don't know how to drive in this stuff."

(Laughter.)

MR. PRASAD: Okay. We'll jump over to section 2.4.8, that is where our first open item is. And it basically relates to the applicant choosing AP1000 design for the site and clearly stating that there is no external border source that would be

required for safety-related cooling at the site.

The staff's review, however, determined that we might need a design parameter that is related to initial filling and occasional makeup purposes for any safety-related water tank that they might have.

And staff proposed two things. One is we could go with the permit conditions, stating that VEGP units 3 and 4 will not rely on any external water source for safety-related cooling water supplies or, otherwise, the applicant can come back and propose design parameters to address that same issue. And staff can review that and say that that is acceptable.

MEMBER MAYNARD: Maybe it's terminology here, but safety-related water -- what does it say? They have to have a safety-related water supply for initial fill and periodic makeup if they're saying they don't need it? I'm struggling a little bit with why they need a safety-related source of water for initial fill or for periodic makeup.

MR. PRASAD: There is a safety-related source of water that is external to the plant. They would need to fill that up eventually. What is the source of that water is not specified in the application? They actually talk about it. It is

coming from another tank that is non-safety-related.

The idea was that if you -- they did not tell us where they will get it from. If they rely on any water source that is at the site, then that is a different issue. And we needed to verify whether that was described in the application or not.

So it's a safety-related tank that is internal to the plant but needs to be filled up initially. And we did not know exactly how much the volume of that tank was and how frequently they will need to make it up and where would that water come from.

Okay. Let's move over to 2.4.9, which is -- let's skip that one. 2.4.10 is flooding protection requirement. All of the flood mechanisms that the staff reviewed resulted in the site grade dry. So there is no flooding protection requirement for any SSE which is located at or above the site grade.

2.4.11 is low water considerations. Again, they were saying that there is no external water source needed at the site for safety-related cooling water supplies. So, even if there was low water in the Savannah River, that is the only water body that is going to affect the plant operation.

Groundwater, 2.4.12, had the next open item, which relates to staff's question as to how after construction of the plant the groundwater elevations and the groundwater distribution at the site would change.

The design specification is that you can have the highest groundwater elevation not higher than two feet below grade. The applicant described the site characteristic related to the groundwater elevation, but staff's review could not conclude that we had enough information in there to say definitely that the water table won't freeze up to that level and violate the design basis.

That is why this open item exists, to basically look at the construction scenario in terms of groundwater and see what sort of points the evaluation might need to do.

Let's skip to the next slide.

CHAIRMAN POWERS: As I looked at the review, it seemed to indicate the staff could hypothesize a different flow pathway for the groundwater.

MR. PRASAD: We are coming up to that. That is actually the subject of section 2.4.13, where

we look at releases of radioactive liquid effluent in groundwater and how it could travel in the subsurface and resurface waters that might be publicly accessible.

There is a lot of concern related especially interpreting site characteristics of site subsurface. And, again, we go back to the notion that staff alternates conceptual models. We basically want to be assured that a sufficient number of alternate scenarios have been considered that could affect radioactive liquid effluent pathways, what those pathways might be, how uncertain they might be, and if there is more than one equally feasible alternate pathway that we need to consider, and ultimately how they lead to publicly accessible waters.

The applicant described a single groundwater pathway. And that leads northwest towards Mallard Pond. The staff's review determined that there could be alternate pathways that don't only lead to northwest. And under certain conditions, particularly in post-construction subsurface conditions, there might be other pathways that could lead to southwest and ultimately out to some branches of the streams that slice out of the site,

particularly the Daniels Branch, and it could lead to Savannah River through those surface pathways.

And that led us to the next open item, which talks about can you please talk about adequate number of alternate conceptual models and how those conceptual models might lead to alternate pathways to the surface waters.

CHAIRMAN POWERS: That's the area that I know, in my understanding, it doesn't seem to me that it matters whether he has one or five. It's that he considered this alternate pathway that leads to a shortcircuiting to the ground and sooner than his preferred pathway. It's not the number of pathways. It's the one that's open and feasible to him.

MR. PRASAD: Right. And the thing is that with the uncertainty related to subsurface characterization, we don't know which one of these pathways might be the most critical in terms of radioactive effluent transport.

That's the reason that we asked for more than one, actually a sufficient number of them, being evaluated to assure that the most critical conditions have been bounded. And that is what is not done.

We don't really know, given the conditions

that are there now and given the conditions that will occur after the construction of the plant has been done, that that particular subsurface pathway is the most critical one.

CHAIRMAN POWERS: And it's the post-construction that is the real issue here.

MR. PRASAD: It is the real issue, yes.

CHAIRMAN POWERS: And the fact that this construction is going to have a large backfill, it essentially acts like a little mini reservoir there.

MR. PRASAD: It could. In the post-construction, you are dealing with changes in the subsurface characteristics. Also, there is going to be significant disturbance of the surface gradients and how those gradients are, whether you are going to put in paved areas or not. So we charge characteristics of precipitation is going to change in the local areas surrounding the buildings that you have.

And that could lead to differences in groundwater elevations and what has been observed historically. So it could lead to a different pathway. We don't know yet where they will be and how they might lead and whether they can be more critical

than the one described in the application.

CHAIRMAN POWERS: You have this as an open item.

MR. PRASAD: This is an open item.

CHAIRMAN POWERS: And you have indicated that the applicants responded to these open items and when or you don't know yet?

MR. ARAGUAS: Well, we're evaluating the responses, but we haven't made a determination as to whether or not it addresses our concern. It's been about a week and a half since we received them.

CHAIRMAN POWERS: What is holding you up?

(Laughter.)

CHAIRMAN POWERS: You didn't have to prepare any viewgraphs or anything like that, did you? Okay. So this is a work in progress here.

MR. ARAGUAS: Yes. I was going to recommend since we addressed the tsunami that we could skip over the tsunami assessment unless you had an interest in going over this.

CHAIRMAN POWERS: No. I mean, we have hit upon it here. This site is sufficiently far inland. It's sufficiently high that if you take something on the order of a 10^{-5}, 10^{-6} level and you say, "Okay.

Even if I take the limiting case that people had talked about, I am probably okay there."

And the staff has initiated some research programs because it's not Vogtle that we're going to be worried about. It's going to be Florida plants, plants closer to the Atlantic Ocean that are at issue here.

And, you know, you're doing a good job there. I mean, I can't be anything but complimentary on looking at this. We are going to get into a contest between experts where you have got the equivalent of expert number 5 that is encountered for the seismic area. And how you handle that is always a challenge.

But I think it's the physical interpretation. It's the dispersion relationships that make a difference there for those long distance sites. To my mind, it is the potential of sites closer to the continental United States that are going to be much more of interest. And there is the coherence of the seaslide and whether it is indeed a local thing or it is a progressive long things and the physics of how dirt moves under water into channels and things like that, an arcane issue.

And, as you have said, the problem is our database is going to be very limited. And we don't have a great deal of information on this kind of phenomena. We've got to look at it.

MR. ARAGUAS: That concludes our presentation.

CHAIRMAN POWERS: Good. And we will come back to the conclusion part where it's in there.

MR. ARAGUAS: The conclusion, right.

CHAIRMAN POWERS: Do members have any questions they would like to address on this presentation?

(No response.)

CHAIRMAN POWERS: Why don't we recess until 20 after 1:00. And we'll get into the seismic areas and other noncontentious items.

(Whereupon, a luncheon recess was taken at 12:26 p.m.)

CHAIRMAN POWERS: Let's come back into session.

At this point we're going to move on to general seismology, though we'll make forays into geology and geotechnical engineering, and the distinctions among those. This is a particularly

interesting site geologically to me, anyway, because it's located on the coastal plain. It has lots of junk on top of the bedrock, and that creates interesting situations, and of course, it is within the general realm of the Charleston earthquake, which I've learned to grow to know and love.

So with that, why not?

MR. McCALLUM: Okay. I'm Tom McCallum. I'm the COL site development project engineer, and I'm going to introduce all of these folks in just a moment.

The first thing I want to do is just give a brief overview of what we're going to cover in our presentation prior to the NRC's presentation. First we're just going to do a program overview. Then we're going to talk about the relevant features of the site layout that's relevant to the geology and seismology of the site.

The next three sections are most of the presentation, and that covers the geology and seismology and the investigations we did for that.

The third major portion is actually the development of the seismic ground motion, how we came up with our SSE, safe shutdown earthquake.

And then the last section is the geotechnical portion where we look at the soils directly beneath the site.

This is our organization of our seismic effort. Southern Nuclear had overall project management. I characterize myself as kind of a facilitator for this process. I'm not a geologist. I'm not a seismologist or anything in that area. For that we have Don Moore is our seismic expert. At Southern Company if you do really well as an engineer you can be promoted to a project engineer. If you do really well above that, you can get to a principal engineer, and above that there's consulting engineer. Don Moore is one of probably two or three consulting engineers in the entire Southern Company system, and he is our seismic expert, and he has directed a tremendous amount of this work and pulled a lot of this together.

Bechtel. For Bechtel, a couple of people I want to mention there is Bechtel did do the overall project management of this. There were a lot of tasks to pull together, to orchestrate. For that we had in the project management area, we had John Prebula, who is here today in the back. Some of the geotechnical

folks at Bechtel that we have were John Davies and Jose Clemente, both in the Frederick office, and neither one of those are here today.

Under the Bechtel block we have william Lettis and Associates, and for William Lettis and Associates we have Scott Lindvall here. Scott Lindvall's area of expertise is the geology and seismology surface faulting; did a lot of work on the Charleston seismic source update, and the location and characterization of the Pen Branch fault, which you're going to hear about today from us and from the NRC.

The next block over is the risk engineering, and we have with us today Dr. Robin McGuire. His expertise area of the site, probabilistic safety hazards assessment. The uniform hazard specter for the rock was heavily involved in that, the uniform hazard specter for the soil horizons, and also development of the ground motion response specter, the SSE; performs base methods there.

The next block over is Bechtel-San Francisco. The Bechtel-San Francisco folks were primarily involved in coming up with the site transfer functions for the seismic models, and there we used

Dr. Farhang Osterdam for the site transfer function. We also had a couple other people to mention, were Dr. Jim Marrone, and he was primarily responsible for translating the horizontal ground motion to a vertical ground motion. And we also had Dr. Joe Litehiser. He's a seismologist, and he was a coordinator for Section 252 of the SAR.

The last group I want to mention is the ground motion review and advisory panel in the oval to the top left, and there we used four recognized industry experts, and we use these men quite a bit in our review of our activities, consulted with them routinely on the phone. We had meetings to discuss our planned approaches. We took their recommendations into our models and made changes as they recommended it.

Now, these men were selected for their particular areas of expertise. We had Dr. Martin Chapman. He's a recognized expert in southeastern U.S. seismicity.

We used Dr. Robert Kennedy. He's a specialist in the seismic structural analysis, and he's also very familiar with the SSE developmental methods.

We also used Dr. Carl Stepp, who is a seismologist, and the was the EPRI project manager for the EPRI SOG, the Seismic Owners Group program. He was also very knowledgeable of probabilistic safety hazards, seismic hazards assessment.

And last is Dr. Robert Youngs, who is an expert in site ground motion and also principally very knowledgeable in PSHA development.

I also wanted to acknowledge that we had quite a bit of help from another area that had quite a bit of expertise, and that's the Savannah River site. They provided technical staff support for seismic survey and other tasks, and they also helped us out with providing us quite a bit of data from the expensive geotechnical investigations that have been done there.

The next thing I was going to mention or go over is the relevant features of site layout. This outline version of the site shows existing Unit 1 and 2. Unit 3, the centerline in containment for Unit 3 and the lines on this chart have moved over, but those vertical lines should actually intersect through the containment for Unit 3 and Unit 4. This line should pass through the containment for Unit 3 and Unit 4.

MEMBER SHACK: That's right on our hard copy.

MR. McCALLUM: It's right on the hard copy. We lost some background stuff for this presentation. So we may have to make adjustments, but their containments are true and are 1,695 feet apart. The units are oriented in a side-by-side arrangement, and Unit 3 and Unit 4 are 800 feet apart.

That spacing is really for two reasons. It's security related. We have to be able to put a security barrier between these two units while this one is under operation in construction, but the distance here is not only security related, but it's also related to the size of the excavation we have to have on site has to be not -- we can't go digging under the particularly listed plant to do the excavations really for two reasons.

A couple other things I'll mention about this slide is the mean elevation, the grade elevation for the site for all four units is approximately 220 feet above means sea level. That's about 120 feet above the river level. River on this slide is off to the northeast, in that direction.

The next section I was going to talk about

is our investigations into the geology and seismology of the region. This is a photo of Scott Lindvall. This is not on site. These are travels throughout some of the areas around the surrounding site, but this is one of the areas that they went to.

In the evaluation of the tectonic features, this is basically a summary of what they looked at, everything from aerial photography. They actually took some flights, took pictures, reviewed the seismicity of the region, contacted local researchers. It was an extensive research effort that took the better part of a year to complete.

The last two bullets were added to the scope as the result of questions that were raised and in the research of Plant Vogtle. One of the things that came about was that there was pretty good evidence that we had the Pen Branch fault on site, and Pen Branch fault as you'll hear later is concluded to be a noncapable fault, but we felt it was very important for us to locate that fault on site if it passed on site because the nature of the Pen Branch fault is that it has two different types of rock. One side is a crystalline rock and the other side is a sandstone, different shear wave velocities, and if

that fault passed underneath the site, we could have been in a situation where one plant was over crystalline, one was over sandstone, and that would affect our model for ground motion.

So we felt it was important to do that, and one of the things we did initially was we did a boring, and we did a deep boring, and we confirmed that underneath Unit 3 -- I'm getting ahead of myself with the slides -- but under Unit 3 we did confirm that we had the Triassic Dunbarton sandstone, that we were in the Dunbarton Basin, and so that left the question of as we continue to the west, did we ever cross Pen Branch fault and get into the crystalline rock to the west.

And so we had the one bore hole, and we decided that the best thing to do at that point was rather than try to do ten bore holes in addition to that, in the west, to locate where that crystalline rock was that we would do these seismic surveys. We brought in Bay Geophysical and worked with Scott Lindvall and others to design the seismic lines.

We imaged. We did four lines on site. We imaged the Pen Branch fault at all four lines. This was the clearest. This was along the River Road to

the south of the plant, and this is looking to the northeast, and this is the Pen Branch fault running at about a 45 degree angle here.

This -- correct me if I get this wrong -- this is approximately the top of the crystalline rock. This is the top of the basemat rock, the Triassic Dunbarton Basin, and what you see here is you see the slip here, and you see an offset in the original contour of the surface of about 100 feet.

Above this there's about 1,050 feet of coastal plain sediments. We confirmed that with our deep boring, and our deep boring as you see on the next slide passes through this location approximately here.

This is a graphical representation of what you just saw. A couple of things I want to point out here. In this graph there is no vertical exaggeration. This is basically a two scale drawing. This boring, we did the boring before the seismic survey. This is our deep boring, B-1003. It took us about six to eight weeks to put in.

The depth of this boring if you're on site and looking around is about two and a half times the height of the cooling towers. For us it's a very deep

boring. It goes about 300 feet into the rock, into the Triassic Basin. This boring was on the Triassic Basin side of the rock.

The other things you see in this drawing, this is a representation of the Blue Buff Marl. This is the bearing layer for the plan. This is a hard, very hard clay material. Below that you have the coastal plain sediments. Above this is the upper sands, and I want to point out here that we do have glass features in the upper sands. We have a limestone that is dissolved away in places; have basically sinkholes, and those are confined to the upper layer of the upper sands.

Of course, you see to the northwest here is a crystalline basemat rock and sandstone to the right. The marl, there is, of course, a warp in the marl that's listed here with this note, monocline, and that monocline is about a 40 to 50 foot dip in the marl as it goes over the fault.

The next slide shows a couple of features you can see here. The yellow lines are seismic lines that we ran. The image that you just saw previously from the actual reflection survey was along River Road at this point. So the imagine was not quite

perpendicular, not quite normal to the fault.

This is a projection of a fault where the fault passes through the basemat. This is a projection upward to the surface. We imaged it at four locations on site. These were our original three deeper bores. This was the deep bore hole that I mentioned earlier. This is Unit 3, Unit 4 in these locations. All are on this side.

This Unit 4 is about 670 feet from the projection of fault. Unit 3 is about 1,200 or 1,320 feet.

The other thing that you see in this drawing are blue lines that represent the upper surface of the marl. This is based on data from Unit 1 and 2, the boring process and the borings that we did. So you can see that on the northwest side of this fault, you can see that the reverse movement of this fault has pushed up the Blue Bluff marl to a depth of about 40 to 50 feet, depending on which of the elevations you're looking at.

One of the things we did to demonstrate that the Pen Branch fault was nonactive, non-capable was a seismic river survey, and I think the NRC has got some slides on this that they're going to go over

in a little more detail later. This is just an image of a site visit the NRC did to actually go over Savannah River and look at some of the river terraces that, based on the elevation of the river terraces this shows that there has been no movement of the Pen Branch fault in quite some time.

CHAIRMAN POWERS: Let me explore that just a little bit with you. As I read the document, it says the terrace, and I forget what the name of it is, but a particular terrace is coherent except where it isn't, and because of that coherence it will attribute no movement, and where it isn't coherent, we attribute that to other things.

Am I following the argument approximately correctly?

MR. McCALLUM: I'll turn to Scott Lindvall for that question.

MR. LINDVALL: By coherency, you mean preserved.

CHAIRMAN POWERS: Yes, right.

MR. LINDVALL: That's correct, and the river terraces, when a river bevels a terrace or cuts a terrace either by a strath terrace or a fill terrace, you're left with a relatively plainer

geomorphic surface, and those are things that we can use as strain markers if they cross over faults or tectonic features to evaluate movement.

The age on the Ellenton Terrace, which is this particular terrace --

CHAIRMAN POWERS: Yes, the Ellenton Terrace.

MR. LINDVALL: -- is estimated to be between 350,000 years and a million years old.

CHAIRMAN POWERS: Right.

MR. LINDVALL: It's quite elevated above the modern river, and its age is consistent with very low down cutting rates in the coastal plain.

However, when you look at the topography, you have over time what happens, as the water recedes, you have a nice plainer surface. Well, you begin to cut tributary drainages across that surface. You also have some carbonate sands and deposits here which are developing karstic type features and depressions in this surface.

So we were largely fortunate to have what you see in this photo, this very flat, nice remnant still preserved in the right location overlying the fault. So that became key in our evaluation.

CHAIRMAN POWERS: So it is the fact that it's preserved over the Pen Branch fault that's seminal here.

MR. LINDVALL: Correct.

CHAIRMAN POWERS: Because otherwise I would say, gee, why didn't you focus on the places where it has been cut because its streams tend to go where there's been faults and things like that.

MR. LINDVALL: They can. I mean, there has been an earlier study that used topographic information from USGS quadrangle maps which had contour intervals on the order of ten feet, and so within that resolution they concluded we can't document any movement on this fault and disruption of the terrace.

But we were able to go one step further and do more detailed mapping and actually go out and survey elevations, over 2,000 data points to try to better --

CHAIRMAN POWERS: So you got resolution on the order of about three feet or something like that.

MR. LINDVALL: Three feet, yeah.

MR. McCALLUM: We have some backup slides on this if you want to use those.

Is that enough of a description or do we need to --

CHAIRMAN POWERS: I understand where they're going.

MR. McCALLUM: Okay, okay.

CHAIRMAN POWERS: I mean, in essence, where you're going is that you're saying I haven't got a capable fault underneath the site. So I can focus all of my seismic threat from the Charleston earthquake, is what you're --

MR. LINDVALL: Seismic zone.

CHAIRMAN POWERS: -- is where you're going with this, which is not surprising. It's the same arguments that have been made at Savannah River for years.

MR. McCALLUM: Just in summarizing this section, these are the same conclusions that we came to when we built Unit 1 and 2 in the '80s. None of the tectonic features were in the vicinity; 25 miles within site area are capable of tectonic sources, and that the dissolution features that we have in the upper sands can be mitigated by removal of those sands and using the Blue Bluff marl as the baryon layer.

CHAIRMAN POWERS: Now, the one at least in

my reading of the things seemed to me that the one other area that arguably had some evidence of tectonic -- presumably could have some evidence of tectonic activity was this Weems ridge of streams, and in the document it seems that you came along and said, well, this guy thought that they could be evidence of fault displacement, but most people think not, and that was the end of the sentence there.

MR. LINDVALL: Well, I could expand on that as well.

MR. McCALLUM: Yes.

MR. LINDVALL: What you are referring to are the fall lines that Robert Weems from the USGS --

CHAIRMAN POWERS: Right.

MR. LINDVALL: -- proposed. He proposed it in 1998 open file report, and we actually took a close look at these features as part of the application for North Anna, which several of these ran, were in the vicinity of North Anna.

As you well know, the main fall line, which he termed the Tidewater fall line is where the coastal plain meets the Piedmont, and you have a series of falls along that where the rivers are navigable up to that point.

Dr. Weems noticed some other features up those rivers which are over steep ingradients (phonetic) and said they're either caused by three mechanisms. One, tectonics; two, migrating mick points due to fluctuations in the sea level; or, three, differences in the erodability of different rock types.

There are also other explanations. Where you have the confluence of two rivers, you increase the stream power, which would increase down-cutting. However, we took a close look at several of these, in particular, two of them that crossed the Rappahannock River in Virginia, where we could demonstrate the Pliocene Age units are underformed across these features, indicating that these Pliocene Age deposits have no measurable deformation associated with them.

There are several other lines of reasoning that preclude these from being tectonic features as well.

The interflue (phonetic) areas between streams or rivers, if this were tectonically produced in the river bottoms in the topography of the rivers, we should be able to see that expression across the countryside in the old Miocene weathering surface in

the Piedmont and we don't. That should be used to receive a much longer signal there and record much greater deformation.

Another line of evidence is if these were tectonic, and there are lots of faults in the Piedmont in the Appalachians and most of them are eastward dipping reverse faults; under the current tectonic stress regime, you would anticipate that those faults would be reactivated in a reverse and a right lateral sense. In other words, you should have up on the Atlantic side in reality what he's observing are areas where the gradient drops toward the Atlantic.

So I could go into others, but we did, I think, a pretty good study on those features for the North Anna, which was an RAI asked for North Anna.

MR. McCALLUM: The next topic is the development of the SSE, seismic ground motion. This is a photograph of our seismic reflection vehicles that did the seismic surveys for the Pen Branch fault.

The probabilistic seismic hazard assessment was -- we thought of Reg. Guide 1.165 in doing this update. We assessed the additional effects of seismicity from 1985 through mid-2005, and then we updated the EPRI SOG, seismic sources to count new

information, and finally we used the actual ground motion models that were provided in the EPRI 2004 EPRI SOG.

This is a complicated picture of the updated Charleston seismic source, and the only thing I'd point out here is that you do see the four sources that are postulated here. The red one was assigned a weight of 70 percent. The other three, the cross-hatched one and then the cross-hatched one there and then the larger black one and then the blue one that follows up to the north were each assigned a value of ten percent.

CHAIRMAN POWERS: With the exception of one of your seismic regions, are you attributing all -- putting the seismic source always on land? You never take it off the coast?

MR. LINDVALL: One of the sources extends offshore to capture the faults that are present out there as a possible explanation for the liquefaction that extends up and down the coast, but it's at a relatively low weight.

CHAIRMAN POWERS: Yeah. I mean, my reading the literature, which is at best piecemeal, seems to be that episodically the consensus were

authors moved that source offshore and then move it back on shore. I mean it's just a low weighting there that surprised me a little bit.

MR. LINDVALL: Most recent other characterizations don't have much offshore. There have been some studies, such as the -- no, I'm thinking of the intensity estimate for the magnitude placed the epicenter out in the Atlantic, but it's due to the fact you just didn't have any recording stations or observations, rather, that side.

CHAIRMAN POWERS: But we didn't have any recording stations at all.

MR. LINDVALL: No, observations on intensity, but most of the characterizations place the source on shore, just on shore in the meizoseismal region.

CHAIRMAN POWERS: Your weightings, you think, reflect the geotechnical opinion nowadays?

MR. LINDVALL: Yeah, we should have this as a backup slide. And this slide, let me see what number that is. Page 23? Yeah.

MR. McCALLUM: We have back-ups to hand out if anybody needs one. We have a few, don't we?

PARTICIPANT: Which one?

MR. LINDVALL: Page 23, and I just might add that this is part of an RAI or an open item response that we submitted a week and a half ago, and I don't know where we are in the review process, but this just compiles four different models that have been put together recently.

The upper left-hand corner is the TIP study, which was the trial implementation study. The one in the upper right is the South Carolina Department of Transportation study.

The lower left here is the USGS source model that has two source zones.

And then the lower right is the one that we updated for this project.

So as you can see, most of them stick pretty much on shore, and most of them are concentrating the source zone in the South Carolina coastal region where most of the observed liquefaction that occurred in both 1886 as well as the paleoliquefaction features.

CHAIRMAN POWERS: The issue especially with paleoliquefaction is the concentration is found always where you look for it, and some places just don't get looked at. What is our understanding of the

completeness with which we have found liquefaction events associated with the seismic zone?

MR. LINDVALL: Well, they're not on this figure, but what has driven the past studies was obviously observations made in 1886, and most of them are concentrated in the meizoseismal area which is basically the yellow region in that upper left panel, typically up in this region or what we have zoned here as the meizoseismal region in the red box.

There have been studies. The primary folks who have studied this are Steve Obermier, who is retired from the Survey; Dave Amick; Bob Gelinas, who actually did research for the NRC, to traverse some of the rivers and drainage ditches to see where they could find these features.

Unfortunately for the areas in South Carolina, we don't have a real good documentation of negative evidence. This is where we've traveled. This is where we have observed no features, and then what are the amount of exposures, the quality of observations, that sort of thing?

But there are inland features that were observed up the Edisto River, and those are plotted on this figure, and the one thing I'd point out is the

zone itself where the earthquake source lies does not have to be directly beneath a liquefaction feature. These features, according to Steve Obermier, were very minor, small features, young, typical of what was produced in 1886, at more distant regions as well along the coast, down to the south and to the north, and the feeling is that, you know, sources within this area could easily cause things this far inland.

MR. McCALLUM: Give me just a minute to move back to the other presentation.

CHAIRMAN POWERS: Oh, yeah.

MR. McCALLUM: Any more questions on this updated seismic source?

This slide represents the mean uniform hazard spectrum for rock for Vogtle. If you have any questions about it, we've got people who can answer.

CHAIRMAN POWERS: Well, the remarkable thing about it is how fast it drops off between about 30 and 100.

PARTICIPANT: That's a log scale.

MR. McCALLUM: Robin, do you have any comments?

MR. McGUIRE: Robin McGuire with Risk Engineering.

Do you mean between 25 Hertz and 100 Hertz?

CHAIRMAN POWERS: Right.

MR. McGUIRE: This just represents the values that were calculated at seven specific frequencies at which we had ground motion equations available. This does not include the step which was taken to interpolate between these values and get realistic spectral shapes. That does show additional energy content at 30, 40, and 50 Hertz, and the slide does not show that.

CHAIRMAN POWERS: Okay. What you're saying is you have just drawn straight line between a point at what looks like nominally 25 Hertz to something that is at 100 Hertz.

MR. McGUIRE: Yes.

CHAIRMAN POWERS: And in fact, you'd expect more gentle roll-off?

MR. McGUIRE: Yes. In fact, it peaks, I think, at 40 Hertz or so, 50 Hertz, and that more realistic spectrum is what was used to analyze the soil column to determine response of the site column.

CHAIRMAN POWERS: So I sit here puzzled why I'm looking at this then. Okay. Continue ahead.

MR. McCALLUM: This slide describes how we then took the uniform hazard rock and developed the soil hazard curves. We first had to develop the soil profile and properties. We had to generate soil amplitudes for all of the rock inputs that we can have. There was a 1D SHAKE analysis, and then we combined those with the rock hazard that you just saw to come up with the uniform hazard specter for soil.

This next chart shows or graph shows the soil rock shear wave velocity that we used in this model. There's a couple of things I'd point out from this. This does go down to 2,500 feet, and a couple of things you can notice here.

You see the upper sands. You can see very clearly the upper sands portion. The Blue Bluff marl bearing layer for the plant lies in this area. The upper sands would be back though. This is then the Blue Bluff mark bearing layer, lower sands going down to transition to Triassic Basin at 1,050, and then the shear wave increases as you get into more and more competent rock.

From that we developed the ground motion response specter for the SSE for Vogtle. It was developed using performance based approach, the ASCE

43-05 method, and the question then was where do you define the SSE for this plant, and we did it per a regulatory guidance. We defined it at a ground surface at a hypothetical out-cropping of the Blue Bluff marl, which is the highest competent in situ material, not at the back fill, which is a manmade added engineered fill material.

That is the SSE that we presented in the ESP. We then calculated a vertical ground motion specter from that horizontal by taking a ratio of the two.

This is both the horizontal in black and the vertical SSE in blue. This is what was submitted in the SAR for Vogtle ESP, and as I mentioned earlier, this is at the 86 foot depth at the top of Blue Bluff marl.

The next section is geotechnical investigations. I failed to introduce John Damm at the end of the table. He's with Bechtel out of Frederick and is involved in the geotechnical work that we did for ESP and the work we're doing now for COL.

This slide describes the geotechnical program, subsurface investigation program for ESP, and

it's being chopped off the page, but we did 14 borings for ESP. One boring was a deep boring that went to 1,338 feet. We did 12 penetrant tests. Three of those were seismic CPTs. We did down-hole testing in three bore holes, including suspension P-S logging, the other activities listed here, the caliper and natural gamma measurements, resistivity, and the boring deviation measurements were all taken in those three bore holes.

There are also 15 new groundwater observation welds that were put in. Ten were in the upper aquifer and five were in the lower aquifer, which is confined by the Blue Bluff marl. And what is not showing up here on the slide is that we also did a laboratory program, testing program, on the soil samples that were taken from those 14 borings, and what's not captured in these activities here is that we already had a number of borings from the Unit 1 and 2 activity that we had, well over 500 borings over the site from Unit 1 and 2. I think 16 or 17 of those were actually in the power block for the new units, and we also had quite a bit of data from the Savannah River site.

The next slide shows the general

subsurface profile. We talked about the upper and lower sands and the Blue Bluff marl. The upper sands, as we mentioned earlier, are very loose. They do have collapse features. The average thickness is about 90 feet in the area of the power block.

Groundwater elevation I point out is at 165 feet, which is about 55 to 60 feet below grade, which will put the bottom of the AP 1,000 above the water table for this plant.

The next layer is the Blue Bluff marl. It's a very hard, cemented, calcarious silt clay. The average thickness is about 76 feet. Beneath that is the lower sands, a thickness of about 900 feet, very dense, dense sands.

MEMBER SHACK: So the groundwater is basically at the base of the Blue Bluff marl?

MR. McCALLUM: The groundwater is above the Blue Bluff marl. Blue Bluff marl is at 90 feet down. So you have got 30 feet, 30 to 35 feet of groundwater above the Blue Bluff marl. That's the upper water table.

MEMBER SHACK: So 50 to 60 feet below grade.

MR. McCALLUM: Right, right. And the last

bullet shows the Dunbarton Basin bedrock. It's Triassic sandstone, and that was located at 1,049 feet below grade.

CHAIRMAN POWERS: I need to come back to your seismicity, my poor understanding probably on some of this stuff.

But this Dunbarton Basin, there's a lower bound to it. You call it the Martin or the Millet or something fault region on there.

MR. LINDVALL: There was a Millet fault that was proposed long ago and has sine been debunked, but there's also a Martin fault that is characterized in that general vicinity. That's at the southeast margin of the basin.

CHAIRMAN POWERS: Right, and is that a capable fault or an incapable fault?

MR. LINDVALL: No, it's not capable.

CHAIRMAN POWERS: And you know that because?

MR. LINDVALL: Well, because actually all of the faults at SRS, including the Pen Branch, displace the top of the basemat. There are a few that don't penetrate beyond that into the coastal plains. So they are clearly older features.

The others that penetrate into the coastal plain have documented evidence of movement within the tertiary some time, but given the similarity of these features the best data and the studies that SRS has performed on the Pen Branch demonstrate the largest of these features that's controlling the basin.

The basin is controlled by the Pen Branch on the northwest side. So that's the deepest part of your basin, if you will, and that would be the master fault.

CHAIRMAN POWERS: Okay. Sorry.

MR. McCALLUM: The next few slides describe our plans for the construction activation, and the bottom line is we plan on removing the upper sands, and this is exactly what we did for Unit 1 and 2, and we will remove them and replace them with a compacted engineered fill just like we did for one and two, very similar to the process that we use for one and two.

And the next slide shows that we're not just going to dig a hole where we're going to put containment. We're going to dig a fairly substantial excavation in the millions of cubic yards of excavation. This slide shows a top view or a plan

view of one of the units with the proposed excavation.

The dotted line that you see on this slide is a zone of influence that comes down from the foundation, the base of the foundation at a 45 degree angle out from the units. We plan to remove everything that could fall within that zone of influence from the nuclear island. It's around the nuclear island.

But we also plan on going down to the same depth for the turbine building, the rad waste building. Basically all of the structures are tied together for the plant.

The next slide shows some cross-sections for that, and the main thing I want to point out here is you can see the dotted line and a 45 degree cone of influence that we will be removing all of the material down to the bearing layer for the site. You can see it in both the north section and the west section. You can see the zone of influence there.

And as Don pointed out, that goes even for the rad waste building and the turbine building, and that's really a settlement issue. We don't want to have a differing foundation between one building and another where they're tied together. We want

everything to settle at the exact same or similar rate.

This last graphic kind of ties all of this together in a fairly simplified graphic. I would point out that everything to the right of the white dotted line is basically to scale, and this view is normal to the Pen Branch. The units are turned slightly because they're not lined up directly at this point.

It shows the deep boring at 1,350. It shows the Triassic Basin bedrock, a coastal plain sediments above that, and the marl layer. It shows the extent of the excavation relative to the coastal plain sediments and the marl layer above it.

The last slide that I had in my presentation ties together what we've done for ESP with how this is going to fit into the COL, and this slide shows the Vogtle ESP safe shutdown earthquake defined at that hypothetical outcropping of the marl. That is our ground motion response spectra.

We have about 86 feet of engineered fill above that. During the COL phase we will propagate that up through the backfill using properties we determined during our COL test program and generate a

foundation input response spectra at the base of the AP 1,000.

CHAIRMAN POWERS: You don't expect this engineered fill to differ dramatically from the engineered fill that you used for Units 1 and 2?

MR. McCALLUM: I'd say that's a true statement.

CHAIRMAN POWERS: So can you give us an idea based on Unit 1 and 2 how you think your ground motion changes?

MR. MOORE: We have done some calculations and brought the ground motion up from the bedrock in the same methodology that we did to bring it up through the engineered backfill and using the engineered backfill properties that were unused for Unit 1 and 2.

And we don't have a plot of that, but the shape is very similar, and as expected, there is some amplification of the motion. But Tom's point is showing is that we are coming up with motion at the foundation level in relation to the safety related structures in the same methodology that we got the motion on top of Blue Bluff marl, and so everything is done in a consistent manner.

And I do want to point out, too, there are some changes in terminology. This happened over the last year. The SSE is now typically called the site specific ground motion response spectra, the GMRS, and the foundation input motion is called the foundation input response spectra, the FIRS. And so this is kind of using the new terms that are being used.

MR. McCALLUM: That is the last slide of my presentation. Are there any other questions before we go back?

MEMBER ARMIJO: How would this compare with Units 1 and 2 as far as foundations and backfill, height above the Blue marl?

MR. McCALLUM: The Unit 1 and 2 actually had portions of the plant actually built on the marl.

MEMBER ARMIJO: The auxiliary building.

MR. McCALLUM: The auxiliary building, the actual portions of the structure actually went down to the marl. The nuclear service cooling towers were actually founded on the marl, and if you look at just construction techniques, you know, for Unit 1 and 2 there was a big hole that was dug, and you started building the plant at the bottom of that hole.

Whereas for the AP 1,000 we'll dig the

hole; we'll backfill it all the way up to, you know, basically 40 feet below grade before you start doing any construction.

MR. MOORE: But to further amplify that, the Unit 1 and Unit 2 containments are sitting or bearing directly on the backfill. I think they have about 30 feet of backfill underneath them.

MEMBER ARMIJO: It's the same kind of backfill that you proposed?

MR. MOORE: Yes, it should be the very same. We're using the same type of material, the same borrow pit material.

CHAIRMAN POWERS: You have now a spectrum that you're going to use and then propagate to the fill. So what do you design to?

MR. McCALLUM: I'm sorry. I didn't --

CHAIRMAN POWERS: What do you design to?

MR. McCALLUM: The question is what do you design to?

CHAIRMAN POWERS: Yes.

MR. McCALLUM: What spectrum do you design to?

CHAIRMAN POWERS: No, no. You've got this spectrum and you're going to propagate it up through

your backfill, and you've got a little amplification to that. How much damage do you tolerate?

MR. McCALLUM: Well, I think the certified design approach is that the AP 1,000 has a certain envelope that it's designed to, irrelevant to which site you put it on, and so when we put that plant on our site, we then have to look at the spectrum and where there may be exceedances, and if there are exceedances, those have to be evaluated.

But the design basis for the plant remains the certified design input, not the site. You know, if you put the plant at a site that has no ground motion at all, you would still have a seismic design basis for that plant that's the same as the design basis for the plant at Vogtle.

MR. MOORE: Can I?

MR. McCALLUM: Yes, go ahead.

MR. MOORE: We're planning to give to Westinghouse -- it's their design -- give them our soil properties and give them the foundation input response time histories. They will take our site specific soil properties and we'll give them some variation, upper bound, lower bound, what have you, and our ground motion, and then they will put that

into their seismic models, and then they will determine if their design levels are exceeded by our site specific parameters.

And I will say that preliminary work has been done. I think I presented that at a March 1st meeting earlier this year, and at least the initial runs that were made show that the in structure response spectra that were calculated as site specific fell below the certified design rule response spectra.

CHAIRMAN POWERS: Okay. So you think we're in good shape here on this?

MR. MOORE: Yes.

MEMBER SHACK: They didn't design a piping system. Will that be designed, a general ground motion or for your site specific?

MR. MOORE: I would like Westinghouse to answer that question, please.

MS. STURDIS: This is Andrea Sturdis from Westinghouse.

The piping design, I assume you're talking about the standard plant piping, not any site specific piping. The standard piping will be designed to the bounding spectra.

CHAIRMAN POWERS: Any other questions?

MEMBER ARMIJO: What if the seismic input was more severe than you estimated based on all of your analysis? For example, the Japanese, the Kashiwazaki earthquake, that event was much more severe than they anticipated. Fortunately the plant designers had so much margin in it the plant wasn't harmed significantly.

You know, how sensitive is your --

MR. MOORE: Well, let me answer that.

MR. McCALLUM: Yes, Don.

MR. MOORE: We looked at the data from the Japanese earthquake that affected the seven unit plant, and we have Unit 1 and 2 operating at this site sitting just like this, and I took the full response, the basemat in structure response spectra for Unit 1 and 2 and plotted that on the actual design spectra for the GE BWR plants at Japan, and it exceeded their design level.

But the measured motion was somewhat higher than our design motion. So my feeling is in talking to our management that these plants at this site will be robust and we should not have any -- it's showing that actually our in structure response spectra at our Unit 1 and 2 Vogtle site was larger

than the one I compared to, which was the Unit 4 at the Japanese site.

And also, you know, this plant here is a certified design at a .3 G, and it's a very robust design for a variety of different soil and rock properties, and I think, as I previously mentioned, when we actually do a site specific analysis, we'll show that the plant may be over designed for our site, but that's not the issue. The issue is that we're buying a certified design.

But I think also it points out that when we look at some of the motions that were measured at the Japanese site compared to Unit 1 and 2 now, we're just as good or better if you're comparing basemat response spectra.

MEMBER ARMIJO: Thank you.

CHAIRMAN POWERS: Any other questions?

(No response.)

CHAIRMAN POWERS: Well, thank you, gentlemen.

We turn now to the staff.

(Pause in proceedings.)

CHAIRMAN POWERS: Do the NST guys need a break?

PARTICIPANT: We're trying to get the CD down.

CHAIRMAN POWERS: Yes. I was wondering if you needed a break to do that.

PARTICIPANTS: We might.

CHAIRMAN POWERS: Why don't we take a ten-minute break?

(Whereupon, the foregoing matter went off the record at 2:24 p.m. and went back on the record at 2:31 p.m.)

CHAIRMAN POWERS: Mr. Li, you're leading this off?

GEOLOGY, SEISMOLOGY AND GEOTECHNICAL ENGINEERING

DR. LI: We have a team here. I have one going to present their corresponding sections here.

DR. STIREWALT: I'll start.

CHAIRMAN POWERS: Okay.

DR. STIREWALT: I am Gary Stirewalt, and I'd like that slide Christian has already introduced by way of a quick slide, the names that you see here. So I'm not going to go through those again.

So we can roll to the next slide, which is going to mention the agenda that we hope to cover this afternoon for you. We're going to talk about a single

point in 2-5-1 that we considered to be noteworthy; that is specifically the Pen Branch fault.

We are going to discuss the issues as outlined on the slide in section 2.5.2. And bringing out open items as we go through these as well.

The next slide is going to illustrate that we're also going to discuss a single concept in 2-5-3, that is the injected sand dikes related to an open item.

And then finally 2-5-4, again, that's the layout of where we're going. So we can, after we've been clever enough to give you that five-minute break, we'll roll.

Next slide, please. Okay, we considered - and mind you, Mr. McCallum and Mr. Lindvall have already very carefully explained much about the Pen Branch. Our concern was as they defined, since it is a fault, that in fact because of its orientation in three-dimensional space does dip beneath the facilities.

So our concern was to make certain with every shred of geological evidence we could muster that this fault in fact was not capable.

They've defined it already as being about

- and also showed you an illustration - about 25 miles long, indicated - is there a pointer? I guess there isn't.

Thanks.

So again, about 25 miles in length, with this being the primary strike orientation, dipping as we just said about 60 plus degrees beneath the little star, so in fact beneath the facilities.

Now the important thing about this is that it exhibits no surface expression of displacement, and it also appears to be aseismic. There is no seismic activity associated with it.

Based on the information that the applicant pulled together, and this is a section that they have already shown you, they mentioned the Blue Bluff marl and the monoclinal feature that they consider probably related to reverse slip along the Pen Branch.

They illustrated this particular section already. You already have that geometry in mind, this being east-southeast. The plant facilities are sort of up here. This dips beneath.

Next slide sort of summarizes the kinds of evidence that was amassed by the applicant, and

certainly reviewed carefully by us in regard to whether or not it's a capable structure.

It turns out that there's reasonable stratigraphic control, and everything that we talk about in the subsurface is in fact defined primarily for the Vogtle site, by geophysical profiles and not by bore holes.

As you saw on that one slide no bore holes penetrated. But that's okay. It was investigated on the Savannah River side as well with bore hole penetrations, and considerable additional seismic lines that we were - they were certain that it in fact extended across the river. And the additional work that they did indicated from stratigraphic control the Blue Bluff marl has an age of about 40 or so million years. That means it's Eocene in age, and based on what they see in the profiles, as we just illustrated, there is no stratigraphic evidence for fault movement later than - later than Eocene; that is, it all seems to be older than about 33 million years.

Now our cutoff, as I know you gentlemen realize, is Quaternary. If it's 1.8- or less, we're really concerned about it.

And this again from our stratigraphic

evidence that they have amassed indicates we have a bracket of it looks to be not younger than - not younger than Eocene, so older that 33.7-.

They also made mention quickly and showed one illustration of the river terrace study that they did with numerous - I've forgotten exactly how many survey points; 2,600 sticks in my mind, and I think that's right.

MR. LINDVALL: It's over 2,000 now.

DR. STIREWALT: Yes, thank you, Scott.

But they did a number of survey points for good control, and the questions that Dr. Powers asked earlier related to the fact that okay this is a rather continuous slab, horizontal surface, and it's the biggest piece of terrace that literally they could find to do the survey.

And again it is effectively a Quaternary surface marker. That's very important, so if we can look at that and make the case that it is not displaced, not distorted, not warped, then this again is very, very good evidence, based on that Quaternary-aged structure that was analyzed, that we have very, very good control, and there does not appear to be any Quaternary age displacement.

And I'd like to show you in the next slide actually an adjusted illustration of that with a couple of geologists to scale. But we have to have geologists to scale.

This is in fact that surface. And visually it looks pretty darn bad. Basically this location is on the Savannah River site, and we are certain from our control, from the geophysical data that this surface does in fact cross the surface trace of the Pen Branch fault. So the Pen Branch fault does underlie this feature.

So if you just visually as you are standing there talking look across this surface, then it clearly shows no extraneous relief that appears to have been related to any thing that could possibly be conceived of as displacement of that surface.

And you also talked about the resolution of one meter. And again, we feel in strong combination with the stratigraphic evidence that we've got very very good evidence that the feature is non-capable, not Quaternary age.

And if there are no questions?

CHAIRMAN POWERS: The focus of attention here is that this particular vault passes under the

site.

DR. STIREWALT: Yes, absolutely.

CHAIRMAN POWERS: And the fact that this terrace is intact is interpreted as meaning that that fault did not move from the time that terrace was laid down until now.

It doesn't say anything about the seismicity of the site itself?

DR. STIREWALT: Correct.

CHAIRMAN POWERS: Just that that particular fault is not the one that moved.

DR. STIREWALT: Right.

CHAIRMAN POWERS: The applicant focuses attention on the Charleston seismic zone, feels that the Eastern Tennessee zone is outside of his domain of influence. Is that correct?

DR. STIREWALT: I will refer that question to my seismology experts.

MS. GONZALEZ: That's true - this is Sarah Gonzalez. The applicant didn't include the EPRI source zones that represented the Eastern Tennessee seismic zone because they contributed to less than 1 percent of the total hazard. They didn't include it.

CHAIRMAN POWERS: There are no other zones

that should concern us, then?

MS. GONZALEZ: Mainly - well, the Eastern Tennessee, possibly Charleston as well as the regional seismic source zones that the sit is located in. That's going to one of the topics we're going to be talking about later.

CHAIRMAN POWERS: I'll wait until you talk about it.

MS. GONZALEZ: Okay.

DR. STIREWALT: Well, Sarah has already picked it up. I guess it's hers.

MS. GONZALEZ: Okay, so I'm going to focus on the most significant items that resulted from our review of Section 252.

The first item is related to the Charleston seismic source zone, and we have two open items related to this update.

So the applicant's update of the 1986 EPRI seismic source model involved significant changes in geometry, maximum magnitudes, as well their occurrence interval of the seismic source zone.

And a major result of the update was that their occurrence interval of maximum magnitude earthquakes within the source zone decreased

significantly, and this resulted in an increase in the overall hazard of the site.

CHAIRMAN POWERS: About a factor or eight, wasn't it?

MS. GONZALEZ: It's big. I'm not sure exactly.

So their update was primarily based on liquefaction features from historic and prehistoric earthquakes. And now Laurel Bauer is going to talk more about liquefaction as well as one of the open items that we had related to that.

MS. BAUER: I'm Laurel Bauer, and I assisted with the earlier seismology review.

I just wanted to give a brief background on liquefaction quickly, and just that these features occur in response to strong ground shaking.

And the liquefaction susceptibility is a function of the site characteristics, and that these features commonly occur in the form of sand blows, and I've provided a couple of figures just so you can see lots of sand blow features and the associated sand dikes and their basic form.

Next slide. There are abundant liquefaction features from both historic and

prehistoric earthquakes along the South Carolina coast for about 130 miles northeast to southwest, and then there are a few that Scott mentioned along the Edisto River that are approximately 65 miles inland from Charleston.

And I'll be discussing liquefaction and paleoliquefaction features, and the paleoliquefaction features are basically formed from the prehistoric earthquakes, versus the historic say 1886 earthquake.

CHAIRMAN POWERS: One issue that I have never understood, and maybe you can help me here is, how does one use radiocarbon dating to date these liquefaction features?

MS. BAUER: Typically if you see like - if you went back to like my first slide where I had some figures of liquefaction, these features will cross-cut other beds, and typically you may have biologic material within those beds, either above or below, that help to constrain those ages.

You can get a minimum age and a maximum age.

DR. LI: You also can find like a chuck hole inside a standard deposit. You can use the carbon 14 method. And also another method called

luminescence can also help to characterize the age of the deposits.

CHAIRMAN POWERS: Basically what you are telling me is that I capture a cockroach or a weed in this sand burrow, and so I date the cockroach or the weed.

MS. BAUER: Right, and it's also possible to take a bulk soil sample and also you can do a dating on the bulk sample to get - hopefully you'll have some biologic material within those samples that will give you an age, a rough age.

And from time to time you can use archeology as well, which gives you like a relative age dating.

CHAIRMAN POWERS: Fascinating.

DR. LI: Sometimes an Indian cultural layer, like Woodland, or certain different periods, can help you if the liquefaction penetrates through that cultural layer you will know it's postdated the cultural layer.

CHAIRMAN POWERS: I just never understood exactly how they did it. The only way I could imagine is that it caught something in the sand blow.

MS. BAUER: Right.

CHAIRMAN POWERS: It just seemed like it would more likely not catch something that it would, so it seemed like a pretty hit or miss sort of thing.

MS. BAUER: It is, it depends on the area that you're in.

CHAIRMAN POWERS: And the other question that I always have about these things is that people go out and they look for them, and they look for them where they can see them, which is in cuts, either man-made cuts, or river-made cuts, or something else.

Well, not every place has cuts.

MS. BAUER: Right.

CHAIRMAN POWERS: And so do we understand what the probability of detection is versus the number that are actually there? I mean you find them up one stream that goes 65 miles inland, and it stands out there all by itself.

MS. BAUER: Right.

CHAIRMAN POWERS: How do I know there is no 95 miles inland?

MS. BAUER: Well, basically you can do surveys to look for them. Are you referring to just staying within those fluvial sediments, the stream cuts, or more inland?

CHAIRMAN POWERS: Well, I can only look for them where I can see them. So something has got to cut the ground where I can't see them.

MS. BAUER: Right.

CHAIRMAN POWERS: And geologists can't by themselves can't cut enough ground to do anything, so somebody has got to do it, or some natural phenomena has got to do it.

But there are an awful lot of places, especially in this area, that there are no cuts. It's flat ground. You saw pictures.

MS. BAUER: That's true.

From my experience in some locations you can use aerial photography where you can actually see sometimes the sand blow features from the aerial photography. And that would be further inland, usually where you've got large fields and large expanse.

You can use archeology in some locations. If you've got archeological excavations where they crosscut these features.

CHAIRMAN POWERS: Let's try the archeologist's nut.

MS. BAUER: Certain people I know of use

ground penetrating radar to look for these features in some areas; that's becoming more common, especially because digging trenches gets to be really expensive and really tedious.

And GPR also helps in defining three-dimensional aspects of these things.

CHAIRMAN POWERS: That's what I was basically looking for, was the impact when you look for these things with ground penetrating radar, something that is not dependent on the accident of a cut.

MS. BAUER: Right. And you could - sometimes you can use bimetics as well.

This slide I put in just to kind of give you an idea of some of the features that resulted from the 1886 event. The black and white photos are all from the Charleston museum, and they show sand craters. And it's difficult to tell in the features but around these edges you'll see the blankets that actually helped form the classic camblo shape.

And then this is actually a trench cut here of a sand blow feature that was snapped by Talwani in the Charleston area.

Next slide. The paleoliquefaction

features documented since the 1989 study, EPRI study, contributed to the update of the Charleston source zone which is why we wanted to present them here.

Liquefaction studies have documented six large magnitude earthquakes during the past about 5,000 years including the 1886 historic Charleston event, and the estimated repeat times for those large earthquakes in the Charleston area are based on two scenarios, a 2,000-year complete history giving a recurrence of about 548 years, and then the 5,000-year history with a recurrence time of about 958 years.

CHAIRMAN POWERS: You have certain things during this that get labeled imaginative - I mean it's great, they go A, B, C, and then they start having C primes and Fs and F primes and things like that.

MS. BAUER: Right.

CHAIRMAN POWERS: And for the life of me I could not understand why we collapse some together and expand others.

MS. BAUER: Well, this was a figure that was provided by the applicant in response to an REI item, and it shows the 1886 event, then it's the A event about 600 years ago, the B event about 1025, and then you get to this C-prime event. And basically

what the applicant did was, they recalibrated data that was provided by Talwani and Schaefer in 2001. And Talwani and Schaefer presented these features as being possibly smaller magnitude events based on finding features in the south and features in the north, and based on what they did was a one sigma calibrated age data.

So the applicant took those dates and did a two sigma calibrated dating, which is really the standard in paleoseismology, because you reduce some of your uncertainty from the radiocarbon dating.

And at that point those dates overlapped, and they pulled that into one large event, which is you look at the features and see prime from the north to the south, they correlate very nicely with the features that the spread, the features that you see in the other events, and then similar with the event occurring.

That answer it?

CHAIRMAN POWERS: Sure.

MS. BAUER: Okay. And when I was referring to the repeat times for large earthquakes, I referred to a 2,000-year and a 5,000-year history.

The 2,000-year history if you look at the

top four 1886 to C-prime, this basically covers about 1,700 years or so, and then you don't see another event until event E in 3585, and then you've got another 1,500 years or so between the next event.

So they base this on a 2,000-year complete history, and then a 5,000-year complete history.

CHAIRMAN POWERS: If I put them on a log normal scale they work just fine. For a nice constant about 7-800 year.

MS. BAUER: Right.

DR. MUNSON: This is Cliff Munson. The other thing just to point out is that they absolutely weight the 500-year recurrence interval much higher than the lower - excuse me, the higher recurrence sample.

MS. BAUER: And say like a logic tree, but a 500-year recurrence interval would be weighted I think about a .8.

On the next slide, so the staff reviewed the evidence for liquefaction that was presented, and felt that the applicant did not provide sufficient paleoliquefaction evidence to rule out the occurrence of large inland earthquakes, based on the figures that you saw previously, most of the liquefaction features

that have been documented have been documented in that northeast-southwest pattern along the coast, with just a few features documented further inland.

And we felt that - the staff felt like the applicant should provide additional information or more sufficient information to document the lack of those features which I think Scott touched on a little bit in his presentation.

But that was the basis for one of our open items which we've just gotten back in again for reviewing, those open items.

And then in addition to that, the occurrence of a large earthquake inland from the coast would - may then necessitate a different Charleston source zone model.

Then we'll move to the next slide. And this gives basically an outline of some of the liquefaction features, and shows a few of the outlying liquefaction features that are further inland.

And with that I'll turn the presentation to Sarah Gonzalez.

MS. GONZALEZ: And I just wanted to add that the applicant assigned the greatest weight to geometry A, which is given by the red box. And so

related to that open item, perhaps you know, well, we haven't actually made our conclusions regarding the adequacy of these weights, because depending on whether the inland source would go further inland basically.

Next slide.

CHAIRMAN POWERS: What you want them to do is to create something more like C?

MS. GONZALEZ: Well, we're just not - yeah they didn't basically provide enough evidence to rule out the occurrence of large inland earthquakes. So whether or not there would be another zone that would extend further inland with some other kind of weighting to exclude that occurrence.

MS. BAUER: And we understand that there has been some observation done of - along streams and further inland where liquefaction features were not found, and we'd like to see some documentation on where those areas are.

MS. GONZALEZ: Next slide, please.

Our second open item related to the Charleston seismic source update, concerns the process that the applicant used to update the source.

They used a senior seismic hazard analysis

committee, or SSHAC Level 2 process, to do the update, and basically this involves a technical integrator, which could be a single entity like a company. In this case it was William Lettis and Associates. And the technical integrators were responsible for performing a literature review, and contacting appropriate experts in the field.

And then the technical integrator is also responsible for integrating all this information to develop a final model of the zone.

So in one of our REIs, we requested additional information related to this expert elicitation prcoess, because we felt that the application didn't include a lot of details regarding this, including you know the questions that the experts were asked, their responses, as well as how their responses were combined into the final model.

Basically we hadn't completed our review of this yet, because it was provided to us just before we submitted our safety evaluation parts.

Based on our preliminary analysis it appears that they adequately followed the SSHAC procedure.

Next slide.

CHAIRMAN POWERS: They weighted - equally weighted expert opinions?

MS. GONZALEZ: Well, the SSHAC Level 3 process is a little more informal. It's based on the typical integrator is responsible for combining these - it's like an overall - how would you say it? They encompass everyone's opinion basically.

CHAIRMAN POWERS: Consensus?

MS. GONZALEZ: Yes, exactly.

Next slide. So the applicant performed an update of the Charleston seismic source. However, they didn't do any updating of any of the other EPRI source zones were used in their PSHA, so, and these included regional seismic source zones that encompassed the site, as well as the Eastern Tennessee seismic zone, which is located at the northwest boundary of the 200-mile site radius.

CHAIRMAN POWERS: It's outside the site radius, I mean the 200 mile zone, isn't it?

MS. GONZALEZ: Yeah, it's kind of - actually if you could go forward two slides, yeah. Okay, that big circle is the 200-mile site radius, so that kind of cluster of - this cluster of seismically, is the Eastern Tennessee seismic zone.

CHAIRMAN POWERS: But this is like a regulatory limit. It's 199 miles away, it's in, if it's 200.1 miles, it's out.

MS. GONZALEZ: Well in the probabilistic hazard analysis it's more to do with how it contributed to the seismic hazard. So the applicant used a criteria that if it contributed to less than 1 percent of the total seismic hazard then they didn't include it in their calculation.

So based on the EPRI model it didn't contribute more than 1 percent.

DR. LI: The applicant is using the RG-1.165 as guideline inside RG-1.165 actually any significant source, even after the 200-mile radius, you still need to consider that.

MS. GONZALEZ: If we could go back a couple of slides.

Okay, so we made both of these open items, because we believe that new information exists that suggests that updates to these source zones might be warranted, and our guidance, Reg Guide 1.165, it states that the use of a presource model is acceptable. However, if new information should arise, then certainly these need to be looked at to see if

they warrant an update.

CHAIRMAN POWERS: They do indicate that there is a reason to update the Eastern Tennessee seismic zone?

MS. GONZALEZ: Yes, in the following two slides I'm going to talk about each of these two source zones, and I'm going to talk about how we have some information, or we believe there is information that suggests that an update might be necessary.

Okay, the first one of these concerns the regional source zones that includes the ESP site. So the EPRI seismic source zones were originally determined by six earth science teams during the 1980s, and one of these teams, the Dames and Moore team, assigned very low rates for large MX in the magnitude values, and very low probabilities of activity to two of their regional source zones.

And if you go to the next slide you can see these source zones. The one in blue, that big blue area, this is the Vogtle site. And the probability that this source zone is active is only .26. So basically the rest of the time there is no replacement source zone.

And you can also see that the next in

magnitude value just very low, there is a very low rate to the higher end.

And if you look on the next slide, you can see that the resulting hazard curves from the Dames and Moore team are about an order of magnitude lower than the other teams, and the other teams have the curves as shown by the darker blue curves there. So there is a significant difference.

And then after we developed our open item which documented this concern, we found the following -

MEMBER ARMIJO: Could you step back to that previous?

MS. GONZALEZ: All right. Sure.

MEMBER ARMIJO: Now all of these curves came from basically the same data, is that correct?

MEMBER SHACK: Yes, these are all the hazard curves that resulted from the applicant's hazard analysis. The 10 Hz hazard curves for the PSHA.

MEMBER ARMIJO: So each team using pretty much the same data came up with different hazard curves?

MS. GONZALEZ: Yes, they all had - well,

they had different seismic source zone inputs, so they each represented seismicity in the area different, based on their judgment, and developed a model out of it, and then this went into the EPRI PSHA calculation.

MEMBER ARMIJO: All right, thank you.

MS. GONZALEZ: So next slide please.

So after we developed our open item, we found the following quotation from DOE Standard 1024, and I'll just read the quotation: Risk Engineering, Inc., has also found that the EPRI team of Dames and Moore does not fully account for historic seismicity near the Savannah River site. One reason for this is the fact that the Savannah River site host source zone was given a low probability of activity. Risk Engineering, Inc., recommended that the Dames and Moore seismic source input not be used to calculate the seismic hazard at the Savannah River site.

So we feel that if the model is not suitable for Savannah River -

CHAIRMAN POWERS: It's pretty close.

MS. GONZALEZ: - it was some implications for the oversight given their close proximity. So this is just something that concerned us.

CHAIRMAN POWERS: You just don't understand

what effect the Savannah River has. That is a consideration.

Have you talked to Dames and Moore?

MS. GONZALEZ: No, we haven't. We haven't talked to Dames and Moore.

CHAIRMAN POWERS: Please continue.

MS. GONZALEZ: But anyway, we had this in an open item, and the applicant provided the response. We haven't had time to review that information yet.

MR. DAVIS: We do have Risk Engineering here. You can ask him what he meant by that quote.

CHAIRMAN POWERS: Love to hear it, but I mean I read the quote.

MR. DAVIS: Well, I think it may have been taken out of context.

CHAIRMAN POWERS: Okay.

MR. McGUIRE: Thank you. Robin McGuire from Risk Engineering.

I'd like to make three points with respect to this quote and the interpretation of it.

First, we were contracted by DOE to do an evaluation of seismic hazard for the Savannah River site in 1991, when the EPRI seismic hazard study had just come out, and the Lawrence Livermore seismic

hazard study had just come out. They were published in 1989, both of them.

And our charge was - and there were differences in seismic hazard among those two studies, and our charge was to find some way to evaluate those, and come up with a combined set of seismic hazard curves that the Savannah River site could use to make some decisions regarding seismic hazard.

And our conclusion was that if you dropped the Dames and Moore seismic hazard curve from the EPRI study, and you dropped two or three high curves from the Lawrence Livermore study, the remaining curves overlap and could be used as one way to evaluate - to develop a combined set of seismic hazard interpretations that could be used for decision making in Savannah River.

The second point is that the senior seismic hazard analysis committee project was conducted subsequent to that, and that's a project that's been referred to earlier in these hearings, as - that was a project to evaluate methods of incorporating expert opinion into seismic hazard determinations, specifically for seismic sources and ground motion equations.

And the recommendation was that once you develop a different interpretation from either sets of earth science teams or individuals, you tease the information out of them, you have them put subjective probabilities on those. You document those. You review those, and you put those on the record.

Then that becomes a study that you can use in its totality to make incorporated combined estimates of seismic hazard for a site.

And once you've done that, you don't go back and reevaluate and pull one team out or take another team out. And that was published in 1997.

So the quote there you see was before that SSHAC recommendation was made.

The third thing is that the SSHAC recommendation and the EPRI-SOG reports were adopted in Reg. Guide 1165 by the NRC as valid ways to make seismic hazard estimates for the nuclear plants.

And it would not be appropriate from a policy standpoint, it would create in fact instability in the policy and regulatory environment if we go back and look at a regulatory guide that recommends a study but then we say, well, you can use five-sixths of the study but don't use the last sixth of it.

So that's why I would say at this point it's not appropriate to go back and take one curve out of that study and use the remaining five.

MS. GONZALEZ: The guidance does say that no information exists - an update of the approved source zone might be necessary. There is that.

I'd like to move on to the next open item, which relates to the Eastern Tennessee seismic zone. In its application the applicant concluded that no new information has been developed since 1986 that would require a significant update to the EPRI seismic source model.

We believe that there are more recent studies that suggest that significant revisions to the EPRI seismic source zone model representing the Eastern Tennessee seismic zone are warranted.

An example of two of these studies include an analysis of earthquake focal mechanisms and hypercenter locations by Chapman and others in 1997, as well as Dunn and Chapman in 2005, and these studies indicate a series of northeast turning basement faults that are intersected by several east-trending faults. And the inferred fault from these studies, which are in the range of 20 to 50 kilometers, may be large

enough to produce significant earthquakes in the magnitude seven range.

Next slide. Although the largest recorded earthquake in the Eastern Tennessee seismic zone is only a magnitude 4.6, a recent study by Chapman, which can be found in the NRC trial implementation project report, concluded that the historical record is too short to rule out the possibility of larger - greater than magnitude 5 earthquakes.

And the mean maximum magnitudes for the EPRI study were approximately magnitude 6.2, and these values are significantly lower than more recent magnitude values, which range from magnitude 6.3 to magnitude 7.5.

So we conclude that based on this information that the applicant was not adequately justified in its decision not to update the Eastern Tennessee seismic zone or perform sensitivity analysis to determine the impact of updating the seismic zone.

CHAIRMAN POWERS: These max-mean values come from whom?

MS. GONZALEZ: I'm sorry?

CHAIRMAN POWERS: You indicated that there are mean-max values on the order of 6.3 and 7.5. Do

those come from Chapman?

MS. GONZALEZ: The magnitude 7.5 comes from the USGS National Hazard maps 2002, and the Chapman and Talwani, South Carolina Department of Transportation, hazard maps use a maximum magnitude of 6.0. And there's other studies as well that have different magnitude ranges.

Next slide. And the last open item that I'm going to talk about relates to post EPRI PSHA studies. The applicant described three post-EPRI PSHA studies which involved the characterization of seismic sources within the global site region.

These included the USGS 2003 national hazard maps, South Carolina Department of Transportation hazard maps, as well as the NRC trial implementation project study.

The applicant dismissed, however, the TIP study, because it focused on the implementation of the SSHAC PSHA methodology.

However we believe that a lot of the information contained in this report, a lot of the data and information, may be applicable to the ASP site. So we made this an open item just because we considered it a valid source of information.

If there are no further questions -

MEMBER MAYNARD: I'd like to go back just for my understanding here to 2.5-1 on whether Dames and Moore are in or out.

I understood what the applicant was saying. I want to make sure I understood what you're saying. Are you saying there is new information - what I understood their position was was that the reg guide says you can use this after all the adjustments have been made and back in the `90s.

And you said that the reg guide says, yeah, but if new data becomes available - are you saying that there is new data available to show changing the reg guide?

MS. GONZALEZ: Well, an example would be the USGS National Hazard maps. They don't have any regions where there is no seismicity for a large percentage of the time.

Actually, Dr. Wheeler from the USGS is present, if he has anything to add.

DR. MUNSON: Maybe before we hear from him, I'd just like to say, this is Cliff Munson, the reg guide calls for updating EPRI if there are new interpretations or new data.

We don't have new data, but we possibly consider this quotation as a new interpretation.

The other item that we need to bring out here is that they have updated the EPRI PSHA in several instances with new ground motion, new Charleston sources, Clinton Head, New Madrid was updated, Wabash Valley was updated, Grand Gulf also had been updated.

So we've been updating this EPRI for all the ESPs that we've done. So we are looking at these low Domes and Moore hazard curves and we're saying why not update this.

MEMBER MAYNARD: Is this the applicant's responsibility or the staff's responsibility to update this?

MS. GONZALEZ: It's the applicant's responsibility.

MS. GONZALEZ: Now Dr. Stirewalt will talk about surface vaulting.

CHAIRMAN POWERS: You just ruined all the things I was grasping hold of. I was so happy to have Eastern Tennessee stay nice and constant and everything else changed. Now I'm going to have to change it. That wasn't kind. (Laughter.)

DR. STIREWALT: This is Gerry Stirewalt again. I want to step into Section 2.5.3 on surface vaulting and just make mention of a single open item there, wrapped around a feature that was observed and mapped in some trenches by Bechtel back in `84, I think, in a garbage trench that in fact did cross the purported trace of the Pen Branch, even at that stage.

These features as described by the applicant certainly did seem to be related to some sort of fluid injection of sand of a given horizon, one horizon, and confined, actually confined to Eocene age rocks point of fact.

But the thing is that there was some I'm going to use the word liquefaction here. Now that does not mean that it was seismically induced. But the point was, our concern developed since we felt, staff felt, that they didn't necessary quantify well the spatial association of those particular injected sand dikes to what they considered to be the mechanism that was in fact this solution at depth collapse of sediments at depth that literally caused the fluids to move around and inject the dikes above.

So one thing that we asked in the open item was simply to provide a little bit more

information on that spatial association, and also please give us a bit more of a description of really what they look like since we have not seen them in the field, and that trench is not open, and also to sort of pin down if they could somewhat better the stratigraphic age relative to what the units will tell us about whether or not it's Pleistocene or older.

We have, as someone said earlier, we have just gotten the responses back through the entire sequence of open items, including that one. So we're currently - they have provided a response. They have provided an illustration as we requested. And we're in the process of simply doing another look at it, to see if we consider it adequate.

And the concern is, as Laurel defined, they use seismically inducted paleoliquefaction features to increase the size of the source area for Charleston and all for the recurrence. So those kinds of features, if indeed they were paleoliquefaction and seismically related, I mean all the geologists recognize, that would be very important.

So we're just simply trying to get a better handle on that, and we had the information; we will be taking another look at that.

If there are no questions on that, I will pass it to Dr. Li on 2-5-4.

DR. LI: Okay, the last section, but not the least section.

The stability of subsurface materials and foundations. And I'm here representing my colleagues who are sitting i9n the back there. Dr. Constantino is from BNL. He will summarize this particular section.

We have a total of about 12 open items on the subsurface material static properties and dynamic properties.

Atkin performed limited borings and tests to characterize the stability of the load bearing layers beneath the site which covered by the open items here.

And there are a total of about 14 borings performed at the site. Three of the 14 penetrated through the Blue Bluff Marl, which is the main load bearing layer at the site.

And the limit to the soil samples and the testing or implement for those materials, too. And a general issue here is that the applicant relied on the results from previous VEGP unit one, two investigations results address the soil property for

the unit three and four. And I can name a few here, such as internal fraction angle, unit weight, and undrained shear strength.

We got our own result based on new exploration, but eventually switched to unit one to say here is unit one and two results. Next slide, please.

And also Atkins did not conduct laboratory tests on soil samples to determine soil dynamic properties. And this dynamic properties are needed. Actually it's very important to determine the site's specific ground motion response spectrum. And this is a new concept, as the Atkins already mentioned this. It's equivalent to the SSE in our previous three years ESP review.

So GMRS will be used to compare the response spectra fro DCD to determine the site suitability. Next.

However, the Atkins conducted more exploration and testing on the subsurface materials after submission of the ESP application. And also additional technical data has - those additions to your technical data has been submitted by Atkins as part of the LWA, Limited Work Authorization two, which

is not included here.

That concludes my 2.5.4 presentation.

CHAIRMAN POWERS: Let me come back to the lines on the results appearing from borings in the - for units one and two.

Is there anything wrong with that?

MR. YI: Well, those borings performed in 1970. So at that time there was a different regulatory requirement, a different standard, like ASTM standard, control those kind of performance tasks. Plus the technology used are different too.

And also in addition on those there is site variability as Atkins addressed in their FSAR. Even at the same site, which is unit three and four, they found that the difference between the shear wave velocity based on the cross vault and the suspension lock. They claimed that is because the site variability means at the site itself, three and four. Don't mention that three and four is far away from unit one and two.

CHAIRMAN POWERS: Well, it's only 1,600 feet. It's not the other side of the moon.

MEMBER ARMIJO: How significant was that variability on some, let's say some particular

property that you think is very important? Was it a factor of two, 10? What are we talking about?

MR. YI: It would totally depend on the material beneath the surface. At some sites this could be very big, if you have some discontinuity beneath the surface.

But it's not necessarily the case at the local site.

MEMBER ARMIJO: No, I'm just asking about where there was unit one and unit two measurements, compared to unit three and four bore hole locations. Pick any one of these properties. I don't know much about this technology, but any one of your important soil properties.

CHAIRMAN POWERS: Shear wave velocity.

MEMBER ARMIJO: Shear wave velocity for example, were there major differences between the actual data taken in the - from the two different sites?

MR. YI: The differences may not be too big, but the Atkins basically - it also depends on the sample they've taken. They've taken so far. If you have more sample that difference can be bigger. But since we have limited sample at this moment, we don't

know how big the difference really is.

MEMBER ARMIJO: So is your fundamental worry that the variability in the properties of the base material, this Marl, Blue Bluff Marl, is so extreme that you can't - you don't know what the properties really are?

MR. YI: Yeah, basically if you do your own survey, you have to use your own data to determine the sites materials characteristics beneath the surface instead of using the results from previous testing.

MEMBER ARMIJO: That's your issue. And they have submitted more information?

MR. YI: I would ask Dr. Cheng whether you can answer. They already have those information, the LWA, right?

DR. CHENG: This is Tom Cheng. Would you please repeat the question, because I sit in the back. I can't hear you.

MEMBER ARMIJO: The question is, has the applicant submitted more data or I guess more bore hole data or something to satisfy this request?

DR. CHENG: As part of their preparation for the COL application they took additional 174 borings. They had a lot of data still in their review

at this time.

DR. MUNSON: This is Cliff Munson. We can give you an example. What seemed to happen on some cases is the laboratory testing of the ESP data gave results that were, I don't know, anomalous, so what they did was, they went back to units one and two.

For example on the undrained shear strength of the Blue Bluff Marl they got a result of 10,000 PSF based on units one and two data, while their ESP data gave them results that ranged from 150 PSF to 4,300 PSF, much lower.

So that was the type of thing that we were concerned about. They've come in with much more data now in association with the LWA, so we're looking at that right now.

MEMBER SHACK: The shear wave profiles they gave us, which had distributions, that is all from the old data?

DR. LI: I think that included old data.

If there are no further questions, we're going to have a summary and conclusion on Section 225. Based on the NRC staff's review we have like five conclusions regarding the whole Section 2.5.

The first one is from Section 2.521. It's

about the Pen Branch fault. We conclude that Pen Branch fault, although it extends beneath ESP site, but is not considered as a capable fault.

And in the Section 2.5.2, the applicant updated the Charleston seismic source based on the paleliquefaction data. It's an improvement over the EPRI source model.

And also Atkins chose not to update local seismic source, and East Tennessee seismic source zones.

MEMBER ARMIJO: Well, that's not a conclusion. That's just a statement of fact.

MR. YI: Sorry.

MEMBER ARMIJO: So these are summary and conclusions?

MR. YI: Yes. And we also need additional description about injected sand dikes to help us finish our review on this particular issue.

And again, 2.5.4, we need additional static and dynamic testing on the soils beneath the surface, and additional borings, and the laboratory tests to - in order to help us finish the review.

That concludes our presentation today. Any questions?

CHAIRMAN POWERS: Any questions for the speaker?

That brings us through, completes the geology geotechnical portion of this presentation?

MR. YI: Yes.

CHAIRMAN POWERS: Thank you very much. We have 15 minutes on radiological, should we just go ahead and do that? Why don't we go ahead and do that, then we'll take a break, and we'll come back and have conclusions.

(A pause in the proceedings)

CHAIRMAN POWERS: We're back in session.

RADIOLOGICAL CONSEQUENCES OF DBAs

MR. DAVIS: I'm Jim Davis, USB project engineer.

We had a couple of points that were brought up earlier. Hopefully we can clear a couple of them up; not all of them, but a couple.

Some of them were on the river flow direction and the elevator release versus the lower release, and Dan Patton is going to address that for us.

MR. PATTON: Dan Patton from Bechtel.

The Vogtle site is on a plateau. It's not

in the river valley. We've used five years of site specific data to characterize the atmospheric dispersion, and the prevailing winds that we've shown from the site specific data show behavior that is like a flat plane within a river valley.

As the wind sweeps across the site, it would continue on and not be channeled as one would expect if the site were down in a river valley.

So we've used the site specific data five years worth to arrive at the atmospheric dispersion coefficients, the X/Qs. We had talked this morning about ground level release versus elevated release. And confirmed that a sensitivity study has been done, shows that the X/Qs are maximized by this assumption of the ground level release.

For the accidents the doses are calculated at the site boundary, and at the low population zone, which is about two miles away. Far enough away that they are out of the wake influence of the buildings, and certainly near enough that this ground level release assumption remains conservative.

Taking the ground level release does not mean that the plume is diminished. This only confines the plume distribution by taking the lower wind -

we're not talking about deposition and loss of the plume due to the presence of the ground or the nearness of the ground; it's just which set of winds conditions are you using and that actually are taking the ground level release. We've actually reduced the dispersion, the atmospheric dispersion, and we wind up with a higher X/Q and more conservative dose calculations.

MR. DAVIS: And I think Bob had one point to make on the suspected -

MR. PRUNTY: Yes, I was going to clarify the question that Dr. Powers had about carbon monoxide versus carbon dioxide.

The section that this is in is 2.2.3.1, which is overall explosions and flammable vapor clouds. And this is addressing the railroad portion of that.

And what we have done is identified through CSX the most hazardous chemicals carried by the railroads. Two of those were carbon monoxides and ETMLs, elevated temperature material liquids.

And the paragraph that addresses those, the first sentence simply stated that the spills of carbon monoxide ETMLs are not expected to create an

explosion or vapor hazard for the site.

And then there was just a little follow up information on those two chemicals as to why they were classified as hazard. And for carbon monoxide, it's because carbon monoxide is an asphyxiant, and ETMLs are a local burn hazard.

It was kind of trying to put in context why CSX classified these as hazardous to begin with.

So I just wanted to make sure that clearly carbon monoxide is what was meant there, Dr. Powers, not dioxide.

CHAIRMAN POWERS: It was indeed carbon monoxide.

MR. PRUNTY: Yes, sir.

CHAIRMAN POWERS: Which is both flammable and poisonous, but it is an asphyxiant as well.

MR. PRUNTY: Asyphyxiant. And I did a little bit of research here on the break, and what most of the sites say is that it becomes an asphyxiant when it becomes fatal, when it is actually absorbed by the blood stream. And that's what the term the way that it really damages you, is through asphyxiation. That's why they use the terminology.

CHAIRMAN POWERS: Go back to this X/Q

issues of the flat plane. When you say you've looked at local weather to determine that, what you look at is wind speed, turbulence, and whatnot. If you have not done any actual testing of dispersion of a chemical from this site?

MR. PATTON: Not testing of a dispersion of a chemical. We've taken the site data, both the lower and upper sets of wind speed and direction to determine that.

So the testing that I talked about doing was the modeling, sensitivity study on modeling.

CHAIRMAN POWERS: Okay. I understand much of that. Okay.

MR. DAVIS: This should be pretty quick. It's a really short topic.

Basically our methodology was to take the accident doses developed in the AP 1000 and then with the developed fusion estimate that we came up with the site parameters using our own MET data. Then we created a ratio of our diffusion estimate with the DCD and multiplied it by the doses that were identified in the DCD for each accident.

So if you take a look at this next slide, it has a title, Out of the Application, shows our

diffusion estimate, the DCD diffusion estimate, and the ratio.

And the next slide is - it shows the Vogtle specific site doses for the exclusionary boundary and the LPZ, and indicates that we are well below the limit for the Vogtle site.

So do you have any questions about that?

CHAIRMAN POWERS: You're happy? Everybody is happy?

MR. DAVIS: Everybody's happy.

CHAIRMAN POWERS: And you did your X/Q and your reg guide? Any questions on what they've done?

MR. DAVIS: And I guess Christian's probably got a couple of slides that do the same thing I just did.

CHAIRMAN POWERS: How's the new job treating you?

MS. HART: Well, I'm not quite doing it yet.

CHAIRMAN POWERS: Oh, okay.

MS. HART: As you can see from my name card, I am still in NRR as of right now, but I will be moving to NRO. And I'm representing the accident consequences branch in my capacity here.

My name is Michelle Hart. I'm a senior health physicist, and I'll be talking about the radiological consequences of design based accidents.

And I have a little more detail than the licensee has provided, so we'll try to go through the slides a little bit faster.

The first slide here is the regulatory criteria that I used to evaluate. And of course it's at the EAD, 25 rem TEDE, for any two-hour period, and LPZ 25 rem TEDE as the outer boundary of the LPZ.

Next slide. They did use revision 15, the approved version of the AP 1000 DZD, and there are design reference X/Q short-term atmospheric dispersion factors for the EAB and LPZ in that DCD, and they're in tier one.

And the DCD does not include the accident specific source terms, in terms of how many curies are released during the time period, so that was an REI question. That was our one REI question in our section.

And those were developed, in the DCD they did the analyses according to our reg guide 1.183, as guidance. And then they determined what the releases would be from that.

Next slide for the ESP analysis they did take the site-specific short term X/Q as developed for the Vogtle site for each off site receptor. And they showed that they were less than the AP 1000 design reference X/Qs for each time averaging period, and I give an example on this slide. You see that the site X/Q is much much less than the X/Q that was used in the DCD for the AP 1000.

Next slide. The accident dose for the site is the DCD dose adjusted by a factor to account for the difference in the site X/Qs to the design reference X/Qs.

CHAIRMAN POWERS: When they calculate these site X/Qs, do they average over a year?

MS. HART: Do they average over a year? I don't think so. I may have to have Joe help me with this.

MR. HOCH: Hello, this is Joe Hoch with the staff. The values for the accident X/Qs we define zero to two hours, zero to eight hours, and such; we take the annual average, or the annual data that they give us, which in this case they give us five years, and we define 16 radial sectors, and we calculate the point five exceedance X/Q, and then we also calculate

the 5 percent overall site exceedance X/Q, and the limiting one is what we use for the site.

In this case it was the 5 percent overall. And while I'm up here, I'd like to make one other point as far as what the applicant said, we would agree, and also one important point to make is that they used the dose calculation, EAB, so they actually were more conservative in the X/Q estimates because they used closer in EAB and LPZ distances.

MEMBER SHACK: This is that half-mile thing they use?

MS. HART: I don't know.

CHAIRMAN POWERS: I mean it sounds like they do use an annual average on this. My recollection somewhere is just wildly different from the rest of the year, this neighborhood.

MS. HART: It's what's been termed before as the worst-case meteorology.

MR. HOCH: Yes, there's no particular average of the annual values. We take hourly data, so we have hourly data for the year. And we take the exceedance based on the hourly data.

MEMBER SHACK: You have that distribution?

MR. HOCH: Correct, based on joint

frequency distribution, so wind speed and stability.

The next bullet I have a very simplified version of how the dose analysis works. And X/Q is very simplified for a specific time averaging varied, the X/Q is directly related to the dose.

So if the X/Q for the site is less than the X/Q used in the design, then the dose would necessarily be less for that time averaging period.

Next slide. This describes that again, that they took the ratio of the site to the design, and that gives the estimate. When you apply that to the dose, that was calculated in the DCD, that gives an estimate of the site-specific dose.

For each accident, they did it for each accident that was analyzed, the AP 1000 DCD.

Next slide. And here's the conclusion from looking at that. The ratio for each averaging period is less than one. Therefore the dose for the site was less than reported in AP 1000 DCD revision 15.

And you can confirm that by taking the source release from the proposed plant and actually using the site-specific X/Qs and determining a dose; four is that way.

Next slide. The staff finding was that we did find that since the AP 1000 Rev. 15 DBA radiological analysis was shown to meet the criteria, and since the applicant showed that the site-specific accident doses were less than the AP 1000 Rev. 15 reported doses, therefore the site would also meet the same siting criteria.

And the next slide. At the seal all stage, if for instance they would - as everyone knows, AP 1000 does have some changes in, for review on their DCD. If they would choose to use the next revision of the DCD, we would reevaluate that and make sure they fit within the site, because that source term and the X/Qs were both included in the front end.

And that completes my presentation.

CHAIRMAN POWERS: Good. We're happy.

MS. HART: Thank you.

CHAIRMAN POWERS: Okay, why don't we go ahead and take our 15 minute break now until five of. And then I think we'll come back and do the staff conclusions at that point.

(Whereupon at 3:46 p.m. the proceeding in the above-entitled matter went off the

record to return on the record

at 4:01 p.m.)

CHAIRMAN POWERS: Okay, Christian, what are our conclusions here?

NRC STAFF'S CONCLUSIONS

MR. ARAGUAS: I just have a couple of slides to get through. Shouldn't take more than a couple of minutes.

And what I wanted to point out was at this stage the staff defers the final conclusions of review of the application until we issue the final safety evaluation report.

But in the interim we have identified some of the preliminary conclusions that we can draw, and just to highlight those briefly, or just to go over how we selected them, was basically if there weren't any open items remaining in those sections, we would assume that those issues had been resolved, in which case the staff figured those items were closed.

And that was with respect to quality assurance, which is Chapter 17, the review of Chapter 11, so that was a doses from routine leaking of gaseous effluence. And as Michelle just presented, there weren't any open items with respect to the

radiological doses consequences in Chapter 15.

The staff also felt that the review for section 2.2, which was the site hazards, had been properly addressed. And the section in 13.6 with respect to physical security.

We can move on to the presentation conclusion.

Just wanted to highlight briefly that as the applicant stated, there were 40 total open items, two firm conditions, and 19 COL action items.

If you compare those to the previous three ESPs, you'd see that there were probably about 15 or so more open items, and that wasn't a reflection of more issues, it was just the staff's ability to separate items out and it was easier to track the closure of those items.

CHAIRMAN POWERS: You've gotten pickier.

MR. ARAGUAS: The former conditions, they are a few less than what was previously identified. And I think that's attributable to the fact that southern reference and actual design as opposed to coming in with the right EBE approach.

And you see the COL action items, that's pretty consistent with what we saw on the previous

three.

I'd just highlight again that the open end responses are in house. The staff has begun a review on those, and I wanted to highlight also that we received the LWA 2 supplement. The staff is working on those, and we expect to get RAIs out for those this week, followed by maybe a second round sometime maybe in November, and then closing out the review sometime around the March timeframe.

MEMBER ARMIJO: You're received responses to all the open items?

MR. ARAGUAS: Not to all - well, we received - I don't want to say received responses, but they responded, and in some of those cases it was, we owe you information we'll get you at a later date once the data has been analyzed.

So there are still a few items that we are waiting to receive, but they addressed that, and gave us a target of when we could expect that information.

CHAIRMAN POWERS: We've moving forward on all the open items?

MR. ARAGUAS: Right.

And then just, again, we look forward to our next interaction in June to discuss the results of

the final SER.

And that's all I had.

CHAIRMAN POWERS: June timeframe. You need to discuss whether you do it in subcommittee or just go directly to full.

MR. ARAGUAS: Was the recommendation to go to full committee?

CHAIRMAN POWERS: Well, I've been wrestling with that.

MR. ARAGUAS: The one comment I'd make to that is the fact that we will be bringing something new to the table, and that's the LWA review, which is a little different than the previous three, where all you were looking at with the previous three is a closure of the open items. So it might be worthwhile to go through a subcommittee.

CHAIRMAN POWERS: And it looks to me like some of your open items really with respect to the seismic issues is sufficiently complicated that it might be useful to have at least a half a day subcommittee meeting before we go to the full committee on that.

It would be nice to have Bill Hinze look at some of these things for us. So we'll count kind

of on that.

Okay, now the applicant did indicate to me he had some comment on Dames and Moore.

MR. McGUIRE: Robin McGuire with Dames - with - (laughter). That's what comes from some longevity. I take my quotes from 15 years ago.

I wanted to respond to Dr. Powers' question to the staff regarding Dames and Moore had been contacted. In fact we have contacted them within the last two weeks, and they confirmed that the interpretation we had made of their sources from the 1980s is correct; that is, that there are certain sources in the coastal plain and in the piedmont that with some probability are not active in the sense of producing magnitudes greater than 5. And that they said reflects their interpretation that there is some probability that parts of the earth's crust will not generate magnitudes greater than 5.

So I just wanted to get on the record that we had contacted them, and our interpretation is consistent with their original interpretation.

CHAIRMAN POWERS: That's a good thing. Good.

Any questions concerning the conclusions?

CHAIRMAN POWERS: Let's move on to lessons learned.

The motivation for this is that the commission has asked us to comment on how well lessons were known. The way they worded it was a little strange.

Not being stupid we can always turn a question into one - that we want to answer. And so we've converted the question into how well is the staff doing on implementing of the lessons learned.

And I will comment that we will also turn that question in our introduction saying that we did not expect by this time we the staff had assimilated all the lessons learned, and to have a complete and flawless implementation of those - the lessons learned activity was a voluntary thing that the staff volunteered to do because they thought it was a good idea.

And the way the question was posed was a little harsher than that. We are going to blunt that and say, whatever the staff has done consider it gravy, quite frankly.

MR. ARAGUAS: Okay, with that, I'll just talk to the agenda very quickly. Let's see I have

four bullets identified. I just wanted to, as you just stated, go through the background of how we got here, and maybe talk about a previous meeting that we've had.

And then I'll go into what the lessons learned were. And then I'll follow up with a status of where we are as far as implementing those lessons learned. And then we can go to any questions.

Slide. So just in summary with respect to the ESP reviews, we have completed two of the early site reviews, and there's two that are still ongoing, and that's North Anna where we're waiting to hear back from the commission, and then of course the Vogtle review.

CHAIRMAN POWERS: But from your point of view North Anna is done?

MR. ARAGUAS: Done, correct.

CHAIRMAN POWERS: Yes.

MR. ARAGUAS: From the staff's point of view, correct.

Following the completion from the staff's point of view on the three early site permit sites being North Anna, Grand Gulf and Clinton, we held an ACRS lessons learned meeting. That was back September

6th of last year, in which case we identified with the industry the lessons learned from the staff's point of view, and some of the industry lessons learned, and how best to address those.

And so what I've done is highlighted on what those topics were that were raised during that meeting, and where we are today. So I'll just quickly go through the lessons learned that were identified out of that meeting.

The first, which was probably one of the more significant, was developing a common understanding between the staff and the applicant.

The second was applicability of 10 CFR Part 21 reporting defects in noncompliance which at the time it was not very clearly in the regulations as to whether it applied to ESPs or not.

The next was the applicability of 10 CFR Part 50 Appendix B which is a quality assurance criteria for nuclear power plants, and there was some confusion as to whether or not that applied as well to early site permits.

Next we'll talk about the development of guidance to ensure reliability of Internet information. Followed by development of improved

guidance on electronic submission of application.

As I'm sure you recall there was a lot of complaints as far as how challenging it was to get these submittals in, and dealing with constant rejection after rejection, and working with industry to get those submittals accepted.

Next slide. Next I'll highlight briefly where the staff is with respect to the ESP definitions that were identified, those being perma conditions, COL action items, the PPEs and the site characteristics.

And then I'll follow with where we are with the development of guidance on the review of the performance based methodology of seismic hazard. As you remember that was quit a lengthy review for the staff with respect to Clinton.

And then we'll talk about the review, what's been done for review the development and study of climate change for the next 20 years.

We'll touch on the - where the staff is with respect to updating guidance for a review of hydrology.

And then we'll close with the - where we are with the development of guidance on the treatment

of high frequency component of seismic ground motion.

So with respect to the common understanding between the staff and the applicant, as I had mentioned in the previous meeting the staff was undergoing the development of guidance for COL applicants, and how to develop that. And that was at the time called DG-1145.

Staff has issued a final version of the document. It's Reg. Guide 1.206; I think that's what - yeah, that's correct, 1.206, and that was issued June 20th, 2007.

Prior to that the staff also issued updates to the standard review plan, which is the staff's guidance. And those were issued out in March of 2007.

There is one that didn't get issued on March, 2007, and that was chapter 19 which came out I think June of this year as well.

Following those two the staff issued it's Part 52 rulemaking, and then the more recently the staff developed an office instruction for guidance on how to do an acceptance review for the incoming COL applications.

And that was actually applied more

recently to the review of the STP COL application.

And lastly the staff and industry have engaged in what we've called the design center working group meetings, where they're identifying policy issues, and addressing standardization across the board.

And so we feel that with these - with the update of these guidance documents, and issuing new regulations, that we will be able to achieve that common understanding between what the expectations of the staff are -

CHAIRMAN POWERS: I have to say in this most recent one, we did not see manifestations of a divergence of understanding between the staff and the applicant the way we did in some of the others.

I mean it looked like there was a common understanding from the get-go on this. I mean you may not always agree with each other, but you understand what you're trying to shoot at.

MR. ARAGUAS: I know they had a representative at last year's lessons learned meeting. That probably helped.

MR. MATTHEWS: I might add - this is David Matthews, director of new reactor licensing - in

addition to those more structured publications we also have since created what's called the new plant working group, which is sponsored by NEI but headed up by Scotty Hinnant of Progress Energy.

And you may recall our efforts a few years ago in the license renewal area, we had a license renewal steering committee. This was the new reactor embodiment of that. And it's a forum for ensuring that we reach these common understandings in a very prompt and consistent way. So that's a kind of informal mechanism we use to address that problem.

CHAIRMAN POWERS: The ACRS as a committee felt very strongly that that - it was only necessary to get a common understanding that there wasn't - there was not a divergence of opinions, and that a lot of the contretemps that we ran into on the other site permits were just, words meant different things to different people, and once you had a common understanding everybody agreed, and it did go much more efficiently.

So we attributed great significance to that particular lesson, as an institution.

MR. ARAGUAS: Next slide.

With respect to the applicability of 10

CFR Part 21, with the issuance of the new Part 52 it was made very clear as to the applicability to early site permits, and if you look and there's actually a table which separates out when you apply 10 CFR 5055E or whether it's Part 21. So it's a lot clearer than it was previously documented in the old rule.

For 10 CFR Part 50 appendix B, it was not previously required for early site permits to meet that. It is now, and it's been made clear in the new rule.

Were the development of guidance to ensure reliability of Internet information as was brought to light during the previous meeting, the staff has not developed any guidance at this point. It was relying on its - the way it handled the previous reviews, and at the time thought that was acceptable.

But I don't know if you had any feedback you wanted to provide on that. At this point there hasn't been any mention of updated guidance for -

CHAIRMAN POWERS: A concern really that is focused not now but more in the future, we foresaw a time when Internet data would be more extensively used, more pandemic than it is now.

So it's getting - for these early sit

permits, it's impressive how much of the information comes from Internet kinds of sites.

And so quite frankly we were worried a little farther down the screen. And we think you ought to get some guidance.

And it boils down to this, you get information, the net is very good at telling you where to go to get information. Once you get that information you've got to validate it somehow. And we need some way to say these numbers really are the numbers that the owner of that website meant them to be.

And to assure that - because it's just too easy to, two things, one, what gets typed onto a website is the product of data entry. And there needs to be some assurance that that data entry was correct.

Next it is something that all websites suffer is that people can come in and change things with you knowing it, and simply do it out of maliciousness or things like that.

And it changes in time as well. And some way to ensure that the data that are being used are in fact valid and verified.

MEMBER MAYNARD: And I think, you alluded

to this, this isn't just an early site permit issue. This is - we'll probably see it on the leading edge because so much of the staff for these applications are being obtained that way. But it's really across the board.

CHAIRMAN POWERS: It's going to apply to any kind of databases that are electronically generated and distributed.

And at least from my perspective, this is becoming a normal mode of operation. We're just seeing it more and more and more. And in fact, we're going to be seeing books that you used to go check out of libraries and read and Xerox pages out of; they're going to be electronic.

Unfortunately, electronic is - you can't tell altered electronic from unaltered electronic. It's electronic.

So we hope the staff will find time to address the issue. Though quite frankly when we wrote that down we were not thinking this year, but we were thinking maybe five years from now.

I don't know, we didn't write down a specific time. But we were thinking in the future when this became more and more common. Because it's

easy to check right now. But it'll become harder and harder in the future.

MEMBER MAYNARD: And I think it might be something that would be worthwhile at one of the future full committee meetings is to discuss some of this. Because I don't think this is anything that has to be gone overboard on. I think there needs to be some guidance and some reasonable approaches to dealing with it.

CHAIRMAN POWERS: Yes, I think that is the real challenge is how to avoid going overboard. Because I can lay down something that is very onerous, and on the other hand, the whole reason to go to electronically distributed databases is to create an increased availability and ease to get to them. So you don't want to undo that.

MR. ARAGUAS: Go to the next slide.

Okay, now we're on to development of improved guidance on electronic submission and applications.

Recently the staff combined the existing guidance documents that were out there for electronic submission into one document. This guidance document was issued June 28th of `07 in the Federal Register,

and more recently the staff published revision two on October 4th of this year in the Federal Register.

And I want to point out that this document is considered a living document, so that as technology changes occur, the staff will continue to update this guidance and address any public comments on that guidance.

And also it created a simplified PDF document submittal checklist that any applicants can go and take a look at. And to make things a little more clear, they've also developed a video clip that an applicant can go to, and it walks you through how to do all the things you need to do to submit your document and get it accepted by the staff.

Another document that exists online is a desk reference guide for PDF document generation.

Okay with respect to the ESP definitions that we laid out in the previous meeting, it was recommended that we should have these documents somewhere in staff guidance so it was clear how to draw the line between what was a permanent condition, and what was a COL action item.

And as I'm sure you remember, in some of the meetings that there was a significant amount of

permanent conditions that actually ended up changing over to COL action items, so the staff actually has a concurrence package now that is going - that addresses these definitions and getting them into the standard review plan in chapter one.

CHAIRMAN POWERS: But the time they got to the end of the previous ESPs, those definitions were pretty well honed, weren't they?

MR. ARAGUAS: Yes, that's correct.

CHAIRMAN POWERS: And that was good.

MR. ARAGUAS: The next is the development of guidance on the review of the performance-based methodology for seismic hazards. You'll notice that they include the guidance developed for that, and that's Reg. Guide 1.208 that we won't have to go through what we did with Clinton with reviewing a new methodology.

Next slide. With respect to climate change, as was brought up during the lessons learned meeting, and I recall for the previous three ACRS meetings on early site permits, the staff has -

CHAIRMAN POWERS: Someone is an obsessive compulsive in this area, aren't they?

(Laughter.)

MR. ARAGUAS: The staff has taken a pro-active approach regarding potential climate changes. It's gone and revised the standard review plan, Section 2.3.1 to capture cyclical extremes.

As we discussed earlier, the staff used a new approach for the Vogtle early site permit review. It considered current scientific thoughts including the 2007 Intergovernmental Panel in Climate Change report that analyzed long term climate trends around the site, and it issued an open item relating to an adequate period of record for design basis temperature datas.

The staff is also in contact with ASCE, and I guess it's the American Society of Heating, Refrigerating, and Air Conditioning, regarding climate change, and currently is attending scientific conferences with respect to this area, and is currently proposing a hurricane research study, and the study should consider the potential increase in hurricane frequency and intensity.

And now I'll turn it over to -

CHAIRMAN POWERS: When you say you're looking for a study, is it a study or just an assimilation of where staff's views of the current

available information?

MR. ARAGUAS: I think the staff is actually undergoing the study of this information, but I'll let Joe discuss it a little further.

MR. HOCH: This is Joe Hoch with the staff. I would be the obsessive-compulsive one with the climate change.

For the hurricane study, we are proposing a study similar to what we did for the tornado in producing a reg guide with frequencies of 10^-7th for wind speed for hurricanes along the coast, and currently that's being reviewed by our management.

CHAIRMAN POWERS: So it's an applied research activity. Because there's a lot of what I would call more academic research going on. And those guys can reach for everything except a conclusion, I'm sure.

You know, there are differences of opinion, and whereas many of the issues get resolved on the East Coast, I think Gulf of Mexico hurricanes nobody will ever understand, because the database just isn't as long. That's why.

MR. BAGCHI: My name is Goutam Bagchi with the Office of New Reactors. And I will talk to you

about the updating of the guidance on hydrology review. This is Section 2.4. I think this area taps into section 2.4 for updated SRP but perhaps was unimpressed. I understood some of the unofficial comments that I heard.

But I wanted to emphasize a couple of things, and indicate to you that in general the updating of the standard review plan was done in such a way that it made the changes really show up in the acceptance criteria.

There is one portion that talks about the regulations related to acceptance criteria, and the other portion relates to SRP acceptance criteria.

And if one paid more attention the SRP acceptance criteria really got some big -- And I just wanted to note that.

In general the hydrology review reflects a hierarchical review approach, just like in case of this Vogtle site. We didn't need to go into the details of every element of the 13 sections of this 2.4 to do a thorough and detailed review; rather concentrate on what's really important here.

In the case of Vogtle site, it was a dry site, so we didn't need to get into a lot of details.

But if you look at the staff safety evaluation report, you'll see what the staff did.

Now tsunami guidelines were - I wouldn't say substantially. Maybe looking at it you wouldn't see a big difference. But it included other effects like draw down in the ocean, and what we are trying to do now is a close coordination with the President's National Tsunami Hazard Reduction Program, and the office of research now has placed its research program with USGS and PMEL, Pacific Marine Environmental National Laboratory - Pacific Marine Environmental Laboratory.

Staff has also participated in international tsunami workshops, and it is now currently participating in development of guideline on hydrology and ridgology evaluation approach has been updated. And as an important understanding, lesson learned from all of this review, the three ESRP reviews that went on before Vogtle is that the site characteristic parameters have to depend on information provided at the site, not based on what the staff calculates. Sometimes the staff calculations are more conservative. So that has been recognized.

We are currently working on the flooding review, Reg. Guide 1.59. Next slide, please.

The high frequency component of the ground motion that really came up when we did the review of the rock side in North Anna, the ground acceleration as a 30 part of the 100 Hertz spectral ordinate, those are quite high.

If you go to the next slide, I want to explain why. If you look at this slide, there are several curves here.

CHAIRMAN POWERS: You need a mike or a pointer.

MR. BAGCHI: Pointer, I don't know if I could do it.

Well, this red curve is the regulatory guide 1.60, and this was like enhancement that was used for the AP 1000-8600 standard design. This Reg. Guide 160.3G spectrum is used for all of the standard designs in the past.

The United States soil type of curve that's developed by use of the performance based design criteria. And this is the rockside curve. And you can see that the exceedance is substantial.

There was a concern how are the applicants

going to proceed with their COL application. It really captured AP 1000 more than anybody else. BWR is being cited at the soil site, so that's not so much of a problem.

And we have extensively drafted with the stakeholders, industry has conducted a number of studies, producing two white papers, and staff has done corresponding review and developed positions.

We have used the technical approach of allowing ground motion input through a realistic incoherency effect, because of the large foundation footprint, and ground motion input is not always required.

But that also involves potential increase in torsion and rocking effects.

The next and the next. So from this strategies we came up with positions that looks at the scope and extent of evaluation of validating existing design for a specific site.

And particularly the effects of the high frequency on sensitive components. Staff has gone ahead and developed an interim staff guideline. It is available in the public web site. It is publicly available information, and we have also updated the

standard review plan section 371, and 372, where it recognizes when there are exceedances where the applicant should be the next day.

In this slide there is some preliminary result. This one shows the in-structure of this one spectrum when coherent ground motion is used. And this is the standard land response factor.

The red curve here is what you get when incoherency effects are considered.

There are still exceedances here, but they have to evaluate and do something.

So I don't want to minimize the effort involved in this. But the staff and the industry have both recognized what's needed. A lot of evaluations have gone on, studies made by EPRI. The staff has reviewed them, developed positions. And a process has been put in place for the entire industry to go forward and the staff to review those.

That you. That completes my -

MR. ARAGUAS: That concludes the lessons learned by the previous meeting.

CHAIRMAN POWERS: I think I'm going to change my view. I think this presentation that you put together on the implementation of the lessons

learned is exactly what should be presented to the full committee. I wouldn't change a thing.

MR. ARAGUAS: Okay.

CHAIRMAN POWERS: Present it exactly that way, and about that time period. And I think it's - I mean it's succinct. It covers the topic. It hits the point, says what you've done and you're done.

So I would just take this exactly - yes, we have to write a response. The commission has asked us to write a response on this. And I think the staff has captured, well, what they've done, what they've not done, what they are doing.

I already had emphasized this whether they are coordinating with the potential applicants, and where they are operating independently.

I think it's a very nice presentation of what the status is. And that is apparently what the commission is asking us is what the status is. And I don't think they even expect much more out of this. I mean you have had more than enough on your plate. I'm surprised at all that you have been able to accomplished.

I mean every time you say, and the staff issued, that's not at trivial thing. That's getting

public comments on it. It's getting concurrences from lots of organizations, as well as the work to develop the draft to begin with.

So you've done a lot. You should be proud of yourself.

That turns us now to the issue of how to present all this material that we've heard today to the full committee. And it has been usual to let the applicant describe the site, and then have the staff come in and describe where they stand in their SER.

It seems to me that split of labor is just as good now as in the past. The applicants of course are free to point out the good features and things they want to emphasize in their description of the site. But here I think it's all pretty clean here.

You might, maybe between the two of you you can describe who is going to describe the Charleston seismic zone. But that kind of split is about right.

They get, what, two hours? A two hour slide. So between the two of you, I would say an hour and 15 minutes of presentation between the two of you at most because we allow lots of time for questions for the committee members that are not there.

MEMBER ARMIJO: Does that two hours include the lessons learned?

MR. ARAGUAS: No.

CHAIRMAN POWERS: No, lessons learned is a separate issue. And I think you've got it here. I just wouldn't change anything.

Is that enough for you guys to put together a presentation? And I'll ask you to be fairly succinct, and but a lot of what you presented today I think you can just go with that directly. I don't think you have to make new stuff.

MR. DAVIS: I'll work with Chris.

CHAIRMAN POWERS: Yes, and get a split of labor. The staff, I think you need to point out your list of open items and list the high points. You've got issues in hydrology and seismic considerations that you need to explain a little bit.

MR. ARAGUAS: That will go to my question: Would it just be easier when we focus, when we give our presentation, just to hit the specifics of the open items in each of the sections as opposed to going through what the staff -

CHAIRMAN POWERS: Yeah, I would say here's the ones that we don't have any troubles with, that we

think are done. And here are major open items. I don't think you need to hit every single one of them. But the major categories of open items, and say where you stand on the resolution of those, and then a truncated schedule that says that you'll be back in roughly June.

MR. ARAGUAS: Should I exclude any of the areas where there weren't any open items, or just continue to have those in the presentation?

CHAIRMAN POWERS: Well, I'd come in and say, here are the areas that are closed out. And unless there is something specific to say about them, where you - when you close an issue it's closed. If somebody has a question about it, I guess they smart enough to ask.

MR. ARAGUAS: That's what I'll do.

MR. FISCHER: For the staff and the applicant it's on Thursday, November 1st, from 12:45 to 2:45. If people didn't already know that.

CHAIRMAN POWERS: Okay. We usually are no more than half an hour off our schedule.

Okay. That's about the best guidance I can give you.

Now I'd like to ask the members if they

have input to this. Start with you, Seth.

MEMBER ARMIJO: I think the staff and the applicant have done a good job. I think things are converging.

Not being an expert on seismic and geology, I'm a little troubled on some of the open items, particularly those where I think the applicant is being asked to prove a negative, which is very hard to do. And maybe I misunderstand it, and I'm looking forward to see what they come up with.

The issue of proving that a large earthquake has never occurred in a certain area by finding evidence of paleoliquefaction seems to me like an almost impossible job. But I may not understand what the staff is asking. And I just assume that the applicant does understand what the staff wants, and you can resolve it.

But other than that I think that things are working pretty well.

CHAIRMAN POWERS: Bill.

MEMBER SHACK: It's clear that the major issues are still the seismic issues, people will discuss the source sounds and the interpretation of those, and I just assume that they will come to some

resolution of the open items.

I'm a little puzzled that the data is so bad on the geotechnical part. I would have thought that we could get those measurements correct.

But I can - I mean they've got 500 measurements, even if they are made with somewhat older techniques. It certainly gives you much better statistics, unless you're planning to repeat the whole 500 again.

But certainly there should be enough new data that somehow is consistent with the old data, which doesn't seem to be the case at the moment.

MEMBER MAYNARD: I think overall things seem to be on track here. I didn't see anything that wasn't being addressed that I think needed to be added to the list of things.

It did come across to me at least with a couple of these open items that are still being discussed, and may be some disagreement on what the ultimate resolution is going to be. I would think it would be good for the presentation to the full committee is to make sure that those get addressed by the staff or by the applicant or by both just so we could get those on the table, more like the 05 2.5-1.

I really don't want to have to go back and read that reg guide to see what I think would need to be done or whatever. But there seemed to be some disagreement there.

But overall it seems like things were heading down a path to a resolution. I didn't see any real show stoppers there. And I think as far as the Internet data, to me that's a more generic thing. I think it's being addressed for this. I don't think that's the applicant's job to address where there is guidance out here.

MEMBER SHACK: It's clear the staff needs to develop guidance.

MEMBER MAYNARD: I don't really have anything else to add.

MR. FISCHER: I certainly agree with my colleagues, things are moving along here, we're making progress. We have a few more open items than usual. But again I think the discrimination the staff has gone through in defining open items. Otherwise things would no doubt close on most of them.

As far as the application there are more situations here where we have statements, analysis has been done, and things are okay. And it is incumbent

upon the staff of course to go review that and make sure that analysis has been done, and the staff has done that.

But I think somebody has the responsibility to bring forward a little more detail on that. And so you may want to think about what you do for this, and with respect to those areas where an analysis has been done, and you verified, and whatnot, what you bring forward into the document itself.

And these documents, these are among the best SERs that the agency produces. And there's been a good track record from the start. This is consistent with that.

What we really really appreciate as an institution, ACRS really appreciates the fact that the staff goes to great lengths to make clear what they have done with respect to each item as they write the SER. That has not always been the case with SERs, and here it's very clear what's done.

The genre is highly repetitive, and there's nothing we can do about the genre. But they are very readable documents. But you do need to be thinking carefully about, when you have done a review at the site of a particular analysis, how much you

bring forward.

I think in most cases you cannot rely on just reiterating what the - what's that in the application itself.

Other than that it seems like it's on track and I kind of enjoyed reading the document. It was weighty enough. It passed the weight test.

Other than that, there's not much I can -

CHAIRMAN POWERS: You have a strange way of getting enjoyment.

CHAIRMAN POWERS: When you travel from airplanes and can't read screens, you get to print those disks. And yes you have blown out at least one ink cartridge for my computer here. And I'll probably be sending you a bill from an orthopedist.

MEMBER MAYNARD: You could probably take care of some of those trees on the site there.

CHAIRMAN POWERS: Yeah, that's why the fire hazard is so low, is we chopped down all those trees.

MEMBER SHACK: Now you have learned to put bookmarks in your PDF files, but the next thing you need to do is assign a style to the figure and table headings so they appear in the bookmarks too.

CHAIRMAN POWERS: Oh good lord, give this

man - he uses a Mac to begin with, so he is an untrustworthy individual by definition.

MEMBER SHACK: And the license renewal people are the people who have really mastered the art of these documents. Everything is linked. You get a reference, you click on it, you go there. If you want standards for how this should be done, they are the place to go. But you guys are coming along.

CHAIRMAN POWERS: Any other comments?

Well, thank you very much. Thank you to the applicant. I enjoyed reading your document too.

I will say that with respect to the Charleston earthquake, and I have been through this with DOE more times than I care to say, that you guys have produced the best description of the seismicity and the geology of that site that I have read. You've done an excellent job on documenting that. Much better than anything I've ever read before.

With that I will close this meeting.

(Whereupon at 4:47 p.m. the proceeding in the above-entitled matter was adjourned.)