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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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REGULATORY POLICIES & PRACTICES SUBCOMMITTEE

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MONDAY

SEPTEMBER 29, 2014

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 1:00 p.m., Dana A. Powers, Chairman, presiding.

COMMITTEE MEMBERS:

DANA A. POWERS, Subcommittee Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

DESIGNATED FEDERAL OFFICIAL:

QUYNH NGUYEN

NRC STAFF:

ANN BRADFORD, NRO

PROSANTA CHOWDHURY, NRO

KEVIN QUINLAN, NRO

SESHAGIRI TAMMARA, NRO

ALSO PRESENT:

DAN BLOUNT, PSEG

BILL ELZINGA, PSEG

MIKE LAUNI, PSEG

JAMIE MALLON, PSEG

ERWIN PRATER, PSEG

MAX ROSS, PSEG

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

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

(1:01 p.m.)

CHAIRMAN POWERS: This is a meeting of the Regulatory Policies and Practices Subcommittee and the Advisory Committee on Reactor Safeguards. I'm Dana Powers, Chairman of the Subcommittee.

ACRS Members in attendance today are Dick Skillman, Steve Schultz, Dennis Bley and Ron Ballinger. I'm told that Dr. Corradini is on the phone line. Is that true or false? We will find out if Dr. Corradini is on the phone line.

As announced in the Federal Register on September the 5th, 2014, the subject of today's briefing is a review of selected chapters, the safety evaluation report associated with the early site permit for the PSEG site.

This is our second subcommittee meeting on this subject, and I guess we'll have maybe one more anticipated?

MR. MALLON: Yes.

CHAIRMAN POWERS: The rules for participation in today's meeting were announced in the Federal Register notice. We expect this meeting to be mostly open to the public. Should it be necessary to close the meeting for proprietary material, I will ask

that the NRC Staff and the Applicant assure that only people with the required clearance and the need to know are present in the room.

We have a telephone bridge line for the public and stakeholders to hear the deliberations. This line will not carry any signal from this end if we need to enter into a closed meeting.

Also, to minimize disturbances, the line will be kept in the listen in only mode until the end of the meeting when we will allocate ten minutes for public comments. At that time, any member of the public attending this meeting in person or through the bridge line can make a statement or provide comments if they desire.

As the meeting is being transcribed, I request participants in the meeting use the microphones located throughout the room. And that means when you get asked questions, you can't just start to talk. You got to come up here and stand in front of a microphone, and identify yourself, and speak with sufficient clarity and volume so you can be readily heard so our transcriber doesn't make ugly signs at me.

We do ask that all cell phones be silenced. Do any of the Members have opening comments they would care to make? We have had our consultant, Bill Hinze,

look at this material. I hope you've had a chance to see his comments. Bill, of course, has great expertise in the seismic portions of this particular application.

With no opening comments from the Members, I think we'll proceed. And Prosanta, you wanted to begin the proceeding, unless you had anything you wanted to add, Prosanta?

MR. CHOWDHURY: Okay, thank you, Dr. Powers. Good afternoon, everybody. My name is Prosanta Chowdhury. I am with the Office of Nuclear Reactors at the U.S. Naval Nuclear Regulatory Commission.

I am the lead project manager for the PSEG site, early site permit application review. And as for my qualification, I have a Master of Science degree in electrical engineering, and a Master of Science degree in nuclear engineering.

I have been with the NRC since April 2005, and since 2008 I have been the project manager at NRO. And I have been hosting this project since May of 2010. So with that, I will go to the next slide.

And the purpose of this meeting, today's meeting, now this meeting will continue until tomorrow, also. But today's meeting is to brief the Subcommittee on the status of the Staff safety review of the PSEG

early site permit application.

And another purpose is, big purpose is to support the Subcommittee's review of the application and subsequent interim level from the ACRS to the Chairman and address Subcommittee's questions.

Today's agenda is just briefly overview the PSEG ESP project. We have covered this at our March 19 meeting in detail. I will also go over the scheduled milestones. Some of them have changed since you saw the milestones last time.

And in this September 29th and 30th meeting, the following review areas will be addressed, geography and demography, and nearby industrial transportation, and military facilities. It is in the application as well as in SRP's 2.1 and 2.2, Chapters 2 Section 2.1 and Section 2.2.

Also, the next one will be meteorology, which is Section 2.3. And then the last one will be geology, seismology and geotechnical engineering, which we will cover tomorrow.

And then we'll go over briefly the safety evaluation. This safety evaluation is with no open items. So it's advanced safety evaluation, which we published at the end of Phase B. This is a four phase schedule, A, B, C, D.

And the conclusion then provides some high level conclusions at the end of the presentation. But I would like to reserve conclusions of all the sections for tomorrow, if that's okay with you. That's how we prepared the slides.

CHAIRMAN POWERS: I think that's fine. Members are getting a little old, but they do have a retention for a full day.

MR. CHOWDHURY: Thank you. And we'll, of course, facilitate discussion questions as needed. We received PSEG's ESP application on 25th of May, 2010. And we completed the acceptance review and the application was docketed on 4th of August, 2010.

We have done some regulatory audits and site visits as listed here. Pre-application site visit was done in January of 2008. Emergency planning site, too, site visit was done in May of 2010, which we discussed at the last ACRS meeting if you remember.

Hydrologic engineering, we have done two audits in February 2011 and then in February of 2014. QA, quality assurance program description related audit was done in May and June, end of May, early June 2011.

There was a geology site audit, which was in some weather conditions. But we did a very good

audit at that time in September of 2011. We had a meteorology audit in May of 2012. And last but not least, we should be discussed tomorrow, or mentioned tomorrow again is the seismic software audit which was done in September 2013.

We completed issuance of all RAIs in September of 2013 as we set the goal in our public milestones. And except for hydrologic engineering safety evaluation, we have issued all other safety evaluations, advanced safety evaluations, no open items, between October 2013 and July of 2014.

On March 19, 2014, the Staff presented to ACRS Subcommittee the following chapters, advanced ASE. Chapter 3 Section 3.5.1.6, Aircraft Hazards, Chapter 11 Sections 11.2 and 11.3 combined, which is Radiological Effluent Release Dose Consequences from Normal Operations.

Chapter 13, which included 13.3 as well as 14.3.10 which is Emergency Planning ITAAC. So Emergency Planning and Emergency Planning ITAAC are combined and presented as Chapter 13. Chapter 15, Section 15.0.3, Radiological Consequences of Design Basis Accidents was also presented. And then last but not least for March 19 was Chapter 17, 17.5, Quality Assurance Program Description.

The remaining milestones is the hydrologic engineering. That milestone, the advanced ASE as well as ACRS Subcommittee meeting, and then the full Committee meeting for all the ASE's are yet to be determined.

The Staff is working on the latest information received from PSEG, and then we will develop a schedule and it will be published. So right now, they're all to be determined.

CHAIRMAN POWERS: When we get to that point, when we schedule that last Subcommittee meeting, we ought to include an allowance for some time to plan the presentation to the full Committee because we've spread this out over sufficiently long time that we're going to have to go back and remind ourselves the remedial material that we'll have to bring to the full committee to get them all on board.

So we might explicitly include in the agenda some chance to discuss what material we bring forth to the full committee and how far in depth to go on that because I've lost track of it because it's almost a year after our first meeting.

And the problem with the full committee meeting is we have to be fairly succinct because they're a little more rigid on their time schedules than a

subcommittee is. And at the same time, we wanted to highlight all the features in this site.

And I think in this case, we also want to highlight all that the staff has been doing with respect to both audits and inspections at the site, but also some of their independent work, some of which we will be discussing fairly in detail tomorrow. So we want to give the full committee a balanced view of all the work that's gone on here.

MR. CHOWDHURY: Thank you, sure. I made a note of that. And I'll work with your staff --

CHAIRMAN POWERS: I mean, it's just a challenge because they'll give us, we'll ask for four and they'll give us two hours, and that's for both people, both sides to make their presentation. And that's a challenge because there's been an awful lot done here.

You know, I am encouraging that the committee get a briefing on estimated times for evacuation before that occurs. So maybe some of that background we had to go through in the earlier presentations will be taken care of for us.

And I think we've already had a background on, we got some background materials on early site permits for the full Committee earlier.

MR. CHOWDHURY: Yes.

CHAIRMAN POWERS: So you know, that background material we're not going to have to cover as far as the basis for the early site permit. But still, there's just an awful lot of material there to cover here, and unfortunately in a short period of time.

MR. NGUYEN: Two hours.

MR. CHOWDHURY: Sure.

CHAIRMAN POWERS: Yes, I suspect that's what we'll get. I mean, I'll ask for four and they'll give me two.

MEMBER SCHULTZ: I really feel that the full Committee would benefit from the discussions associated with the inspections and site audits that have been done. And because of the time limitations, perhaps then preparation a document that summarized that information for the benefit of the Committee Members will be helpful.

CHAIRMAN POWERS: Yes, Steve, can you put together just a little note making that specific proposal?

MEMBER SCHULTZ: Yes, I will.

CHAIRMAN POWERS: That way we can pass it on to Anna and Prosanta to think about it. But in general, the Committee is very interested in the work

the Staff does, not just reading the material, but actually independent verification and confirmation.

I sometimes think the staff de-emphasizes in their presentations to the Committee how much it takes for them to get down and write down this looks good, you know, before they get to that. Don't understand how much is involved there.

MR. CHOWDHURY: Okay.

CHAIRMAN POWERS: Also, it would be of interest for us at some time, maybe not associated with Committee meeting per se, but maybe a subsequent discussion, to understand what things are difficult in doing these ESPs and what things are easy. Where you think you have good tools and whatnot, adequate tools, and where you think better tools, better support structures, more manpower is required.

But that may be a completely separate discussion. It would be useful for us to understand those things, especially when we talk and discuss things about research and site sort of stuff. You know, things that would make it easier to do these things and yield a better product.

MR. CHOWDHURY: Okay. We'll certainly do that. Let me go to Slide number 7. And let me also say that once I finish my introductory slides, I'll

request my acting Branch Chief Anna to say a few opening remarks, and then we'll move to the next slide.

So you have seen this slide before. This is a copy of the slide from previous. There's no reason to revise it. Proposed site is located in Lower Alloways Creek Township in Salem County. And then it is adjacent to the currently operating Hope Creek Generating Station.

The applicants are identified here, and then the application, early site permit application is for a single or dual unit reactors.

Very briefly, PSEG developed and submitted a Plant Parameter Envelope based on one unit U.S. EPR, one unit AVWR, advanced volume of reactor, U.S. APWR, and two unit passive AP1000.

So the new plant may be as we discussed before, a different design that falls within the envelope. PSEG requests a permit approval for a 20 year term. PSEG did not seek approval for limited work authorization. And PSEG did seek approval for complete and integrated emergency plans with ITAAC as part of the ESP.

We have, at the last presentation we did not specifically have a list of acronyms. And we, you know, to that the comments we heard from different

sites. And then we included a very comprehensive list of acronyms that's applicable today and tomorrow's presentation.

CHAIRMAN POWERS: Tomorrow we will need them.

MR. CHOWDHURY: And with that, I would like to request Anna to say a few words.

MS. BRADFORD: Thank you. My name's Anna Bradford. I'm the acting Branch Chief for Licensing Branch 1 right now in the Division of New Reactor Licensing while John Segala is on rotation up to the EDO's office.

So Prosanta gave you some good background information. We'll be here talking to you today and tomorrow about sections in Chapter 2. The technical staff I know, I've seen their slides, and they're really prepared to give a good discussion of the technical review. So we look forward to these interactions. Thank you.

CHAIRMAN POWERS: Well, Anna, you violated one of the ground rules that Prosanta and me did not violate is the Subcommittee likes to get to know something about your background.

MS. BRADFORD: I'm just the Branch Chief. I thought --

(Simultaneous speaking)

CHAIRMAN POWERS: That does not excuse you.

(Simultaneous speaking)

MS. BRADFORD: Okay. My name's Anna Bradford, like I said. I have a degree in mechanical engineering from Virginia Tech and a degree in Environmental Engineering from Johns Hopkins.

I worked at an engineering consulting firm for a few years, and then came to the NRC in 2000. I've done some work on low level waste, reprocessing waste, waste storage. I was in the Chairman's office for about three and a half years as his nuclear materials technical advisor.

I've been a branch chief at NRO for about two years. I'm usually in the Division of Advanced Reactors and Rulemaking dealing with SMRs and non-light water reactors. And I've been in DNRL for about two, two and a half months.

CHAIRMAN POWERS: Okay. See, that wasn't too painful. Now we know a little bit about you. And I will comment, that's true for all of our speakers. We do like to know a little bit about your background and whatnot. And you know, people that are Aggies, we get to tell Aggie jokes.

MR. CHOWDHURY: Thank you, Anna. So, Dr. Powers, unless you have questions for me, then it will be PSEG who will do the introductory remarks I suppose, and then we'll go into the first --

MR. MALLON: That's correct.

MR. CHOWDHURY: -- chapter. And then we'll follow the similar sequence that we did last time.

CHAIRMAN POWERS: Yes, I think that worked out marvelously to my mind.

MR. CHOWDHURY: Okay.

MR. MALLON: So I presented in March, but I'll give a brief --

CHAIRMAN POWERS: I was going to say, understand the members are getting a little old here, you know, the short term memory goes to hell on you.

MR. MALLON: I've been in the industry for 30 years. Worked on the design of plants at Stone and Webster, Nine Mile and River Bend. Worked at Limerick for a number of years in radiation protection, a year and a half at Sandia Labs.

Then I was at Maine Yankee where I was the radiation protection manager during decommissioning. I left there in 2000 to join Exelon, and I was the radiation protection CFAM for Exelon. So that's the person at corporate responsible for corporate

functional area manager is the acronym. And I was responsible for radiation protection across all of Exelon's 17 stations.

After three years in that job, I have an SRO cert from Peach Bottom. So a four month program to give an operator level knowledge of how the plant operates. I was then down at Peach Bottom as training director, regulatory compliance manager.

And then when Exelon was going to merge with PSEG, I was part of the management team that went over to PSEG as licensing manager. I oversaw the Hope Creek EPU at that time.

That merger fell apart, and we all had choices about whether to go back to Exelon or stay at PSEG. The final count was about 22 stayed and two went back. So I was one of the 22 that stayed, and I got involved at nuclear development in the '08 time frame. And now I'm the manager of our nuclear development effort.

I have a Bachelor's Degree from Franklin and Marshall College in Physics. So with that, thank you for having me here. I appreciate the opportunity to speak again about our application. Prosanta, next slide. Actually, you might as well go two.

So I'm just going to review briefly what

we talked about in March. We started the effort in '07 with a feasibility study. Could we put a new nuclear reactor on our site? The answer was yes.

At that point, the Board of Directors authorized $100 million for us to start a COLA effort. And the team was assembled, and we started work on that. But at the time, the design certs were under review. It wasn't clear to us, Salem is a PWR, Hope Creek is a BWR, which technology to choose. We didn't care.

We wanted one that had some licensing certainties, some construction certainty, and some operational certainty. And we couldn't answer those questions in the '08 time frame. So we decided to look at the ESP and get us into how Part 52 was originally envisioned that you would get a site approved.

We worked, at that time because of the uncertainty, we did a plant parameter envelope. Now Graham Gulf, Clinton, and North Anna were all plant parameter envelope ESPs. They did include some technologies like the pebble bed reactor and the CANDU reactor that were not under review by the NRC.

So we took some lessons learned from the NRC and NEI and culled the possibilities down to technologies that the NRC was familiar with and had in front of them. Next slide, please?

When we set up the organization, I'm a PSEG Power employee, and we put up a firewall between power and nuclear. In the '80s there was problems. The operator sleeping at Peach Bottom when Limerick was being built, problems at Turkey Point when St. Lucie was being built, and then the CONMED system, Dresden, Quad and Zion were on the watch list while LaSalle, Braidwood, and Byron were being built.

So we put up a firewall. We're over on PSEG Power. We're down near the nuclear site, we're in the old training facility in the town of Salem, New Jersey. And we do work closely with nuclear, but we are separate. We can't distract them.

I should note on this slide, this is the original organization as it existed in 2010. Since that time, MACTEC has merged with another company and is now AMEC, and that's who did a lot of our environmental work and a lot of our geological work and hydrologic work. Thank you.

So not to hit this too much, but it kind of lines up with what Prosanta said was a lot of activities that we undertook to prepare our application, a lot of studies, the NRC was involved in those. And we submitted May 25th, 2010.

And that didn't end our work, it rather

just began it because at that point, we started the NRC review started, and since then we've had over 400 questions that the NRC has asked us during the review. And we've answered, I believe, 92 percent of those in less than 30 days.

We had our first ACRS meeting in March. Some of the protracted nature of where we're at is Fukushima was an important element of that. The seismic re-analysis, hydrologic re-analysis, and there was also some Congressional budgetary issues that came along in this time frame and held up our review effort.

Moving forward, in '10 and '16, those dates are tentative. That's our optimistic hope of when things can land so that we can finalize our effort.

CHAIRMAN POWERS: Pending one more section we have to go through, this lines up pretty well with what our plan is. So I hope it's more realistic than optimistic. I don't know.

MR. MALLON: You know, when we put this down here, we obviously are working closely with Prosanta. And so this is informed with what he knows. But clearly, where the green box is for the next ACRS Subcommittee, that would be hydrologic.

I threw it at the end of the year 2014. I'm hopeful that can happen. That may be in the first

quarter of '15. So that's an example of something that may be optimistic.

CHAIRMAN POWERS: Yes, it's getting to the point that it's hard to get into that schedule and, you know, we virtually can't get into November now and December's getting kind of dicey.

MR. MALLON: And December's tough for everything.

CHAIRMAN POWERS: Yes. But like I said, it lines up close enough to what we're planning that it doesn't cause me any heartburn right now.

MEMBER SKILLMAN: Coming from a process perspective, you're in the middle of early sub permit process, you're marching to the cadence that comes with the rigor for this portion of the regulation. What substantive changes, if any, were triggered by Fukushima? What did you have to do or redo?

MR. MALLON: The two main ones are the change in the seismic source model from the EPRI SOG model to the CEUS model that came out in January of 2012. And shortly after that, we got the RAI to re-look at what our GMRS would be.

And then, we had some questions, and part of it was because we're a wet site and the Fukushima re-analysis of flood for Salem and Hope Creek, I want

to be careful that I don't publish a number for the ESP that causes us to question operability of the operating units.

So we wanted to make sure we did a good job and did a job that would support continued operation at Salem and Hope Creek. And so that took some extra time. And those are the two big areas.

MEMBER SKILLMAN: Thank you.

MR. MALLON: Sure. Thank you, Prosanta. So remind us all of where our site is, we're about 52 miles up from where the Delaware Bay meets the Atlantic Ocean. We're at the transition point between the bay and the river. The actual Mile 48 is where the Coast Guard and Army Corps of Engineers define the river versus the bay, and we're at Mile 52.

The water's brackish, high flow. Tidal flows in this region are about 472,000 cubic feet per second. And the river is over two miles wide, so there's a lot of water moving by us. Next slide.

MEMBER BLEY: I think at our last meeting, I think you gave us a little story about the debris problem at Salem and why you were not going to have that same problem.

MR. MALLON: Yes.

MEMBER BLEY: Is my memory right on that?

MR. MALLON: Yes. The next slide might show it a little better. So we are looking due east, and the intake for Hope Creek is under the K of Creek. Okay, the intake for Salem is off to the right and south is to the right, and that intake is on the southern reach of the piece of land that we're on.

What happens is the tides and the grasses circle around in that area and cause extreme grassing to come on the Salem --

MEMBER BLEY: So they just pile up?

MR. MALLON: Not the safety related intake, but the circ water intake. And they've had as much as 56 tons in an hour, so almost a ton a minute of grass they have to pull out during grassing season. When we were looking at where to site the plant, we wanted to make sure we were not on that southern side.

CHAIRMAN POWERS: You may not be smart, but you learn quickly.

MEMBER BLEY: The stories I've heard is almost everybody on the site's gone --

(Simultaneous speaking)

MR. MALLON: And in May when it's bad, it's really bad. We have done a lot of engineering work to redesign what the grass does, and we did a lot of studies. And we showed that about 40 percent of the

grass was recycled.

So it was stuff that we washed off and dumped back out, and it came back around. So we refined that and reduced that significantly. But yes, that's why we ended up with the proposed power block where it is, north of Hope Creek.

You see under the word proposed and power some water there. That's the desilt basins for when we desilt the intakes, the safety related and non-safety related, we discharge them there. And we're permitted to do that, and that's the source of that water.

The water all the way to the left on the slide, that's the Army Corps of Engineers confined disposal facilities for their efforts to dredge the Delaware River. And that's where they deposit dredge spoils, and that's the water you see.

So we followed the regulatory guidance at the time, we followed Part 52, 1.206 standard review plan. We did all the studies that those documents required, and that was the basis for our application. Next slide, please.

And the plant parameter envelope. So we spoke extensively with the folks from Clinton, North Anna, and Grand Gulf, as well as NEI and the NRC Staff

before we undertook the plant parameter envelope, and the Vogtle people, because frankly, they said to us they gave away a lot of commercial advantage by selecting the AP1000 for their ESP.

And they said if they had a do-over, they probably wouldn't do it that way because they're signed up with that particular technology then. So we worked on the plant parameter envelope. This is the bounding value, bounding high, bounding low depending upon which way you're going with the parameter which direction is conservative.

For the impact of the plant on the environment, that would be radiological normal, radiological emissions. It would be embedment, how deep do you have to go down to excavate to a competent layer and then fill back up. Next slide.

MEMBER SKILLMAN: What three, Clinton, North Anna and which?

MR. MALLON: Clinton, North Anna, and Grand Gulf.

MEMBER SKILLMAN: Oh, Grand Gulf, thank you.

MR. MALLON: So we worked with NEI afterwards and we wanted to take the information that we had learned. And Exelon was part of that, and that

information about how to develop a plant parameter based application.

And that's memorialized in NEI document 10-01, and we contributed to that. And this is the graphic that we took from that document, modified slightly. But you fundamentally at the top take information from the vendors, from the multiple designs, and you split it off into whether it's a parameter like how much snow they can take on the roof, that's a site parameter that they designed the plant to.

It doesn't go into an ESP, it goes off for commercial decision making or COLA. So if I get more snow than that reactor design can withstand, I either, when I get to commercial decision making, I have to vote them off or I have to take a departure in COLA time with the additional costs that that will include.

You come down to the plant parameter envelope which are the reactor parameters and owner engineered parameter. So for our location on the river, the brackish nature of the river, the cycles of concentration and of cooling tower, that's an example of an owner engineered parameter that the reactor vendors can't tell you, but I have to do some engineering in order to put it together in an ESP

application.

And then the site information is used to develop the site characteristics. And that's what goes into an ESP application. And with that, I'm ready to go into 2.1.

CHAIRMAN POWERS: I would just comment that since I've been through all of these early site permits that I found the ones easier to deal with were in fact the plant parameter envelope plant than a design specifics.

MR. MALLON: How about that.

CHAIRMAN POWERS: We've got a little more wiggle room there. I mean, as a personal observation. I'm a big proponent of the early site permit program because I think it gets a bunch of stuff out of the way. At the same time, it also gives us a chance to focus on that stuff, whereas it may get short shrift in looking at a larger collection of material. And so just a couple of personal observations.

MR. MALLON: With that, I'm ready to go into 2.1, and I'll ask Dan and Bill to come on up. And Dan, you want to start with introductions?

MR. BLOUNT: Sure. Good afternoon, my name is Dan Blount. I'm an Engineering Manager with Sargent and Lundy. I have a mechanical engineering

degree from York College in Pennsylvania.

I'm a registered professional engineer in the State of Delaware, and I began in the nuclear industry in 2001. I generally work within the design engineering and licensing application fields. So today, we're going to --

CHAIRMAN POWERS: Oh, you're going to go later. Okay.

MR. ELZINGA: Yes, I'll save it.

CHAIRMAN POWERS: Okay.

MR. BLOUNT: So we'll start off with Section 2.1, geography and topography. I'll walk through the site location and DAB portion. Next slide.

So this slide shows a view of the PSEG site. This is a view looking north with Salem and Hope Creek in the foreground as Jamie discussed. The existing site is a 734 acre site with a currently in agreement and principal with the Army Corps to acquire an additional 85 acres to the north of the site. On the slides, the area effectively west or left of the Hope Creek cooling tower that's shown there.

As part of the PPE based application, we developed a site utilization plan, and we handed out some hard copies of that to everyone earlier so that you can see a higher quality view of that. That site

utilization plan is developed in an effort to bound the various reactor technologies under discussion and the site layouts of each of those reactor technologies so that we can encompass the various plant buildings that each reactor technology may have.

I'm going to move to the next slide to talk through the site utilization plan. The site utilization plan shows the power block area in green, the cooling tower area in blue to the north of that. That's what's in that 85 acre U.S. Army Corps exchange property.

In black hatched area is the proposed switch yard areas. The hatching on the drawing indicates areas that are permanent facilities. The diagonal hatching are areas like parking and laydown during construction that will be put back to their existing status after construction is completed.

The site center is defined as a centroid about all of the containment center lines for each of the four technologies considered, and that's shown in the power block area. I think it's probably better highlighted on the drawing you have in front of you.

The exclusion area boundary is the magenta circle that goes 600 meters, at least 600 meters from any point from the power block. That was defined in

that manner. That encompasses land area that's owned and controlled by PSEG, but also land that is owned and controlled by the Federal Government and the U.S. Army Corps.

It also goes over the Delaware River area, and that area would be controlled by the Coast Guard in the event of an emergency.

MEMBER SKILLMAN: Dan, you mentioned that the 85 acres is a swap area. Swap what with what?

MR. BLOUNT: It's a land agreement with PSEG and the Army Corps.

MR. MALLON: When we started looking at it, we could site the facility entirely on our property.

MEMBER SKILLMAN: Current property?

MR. MALLON: Our current property. And you see the area a little to the northeast of the Hope Creek cooling tower? There's no hash marks there. It's undisturbed. That's wetlands. So one thing, by building on the CDF, the Army Corps CDF, we can minimize environmental damage to our site.

We acquired this land for the current operating units from the Army Corps in the '60s. How they do that is a land swap. They cannot sell land to a private entity. They can swap, and it has to be beneficial to the Federal Government. They can't be

one for one, it has to be one and a half for one.

So we worked with the Army Corps and identified a property further north, about 30 miles north of this site, and it's about 423 total acres of which 373 will be available to the Army Corps. And we're working through permitting from the State of New Jersey for that, as well as an EA for the land swap with the Army Corps. That's happening as an independent process.

MEMBER SKILLMAN: Okay. Now I understand the swap. Thank you, thanks.

MR. BLOUNT: With that, I'll hand it over to Bill Elzinga.

MR. ELZINGA: Sure. My name is Bill Elzinga. I've got 30 years of experience. I'm with AMEC Environment and Infrastructure. My undergraduate degree is in biology from Calvin College, and a graduate degree at Southern Illinois University.

In my 30 years of experience, I've done a lot of facility siting and licensing, quite a number of projects at nuclear facilities, as well as non-nuclear facilities. And much of my work has been in the NEPA arena, and I happen to teach a graduate level class at Southern Illinois University and have been doing that for 20 years on NEPA.

MEMBER BLEY: I want to just back up a little bit. I'm thinking of the map that Jamie showed us. And the EPZ are kind of cutting through Salem and Hope Creek there. Are there issues of emergency planning and things that create some kind of difficulties when you have separate EPZ's for the units but they're overlapping in any way? I never thought about this before.

MR. MALLON: We actually, I think, were somewhat fortunate in that we are co-located because the resources that we can bring to bear is much larger.

MEMBER BLEY: But there aren't any difficulties with the local governments or the state?

MR. MALLON: No. For the ten mile EPZ purposes, we don't really shift it that much. In the E Plan, we simply describe the current Salem and Hope Creek ten mile EPZ. There's a little sliver that isn't in there, but typically you grabbed larger than the ten mile circle. You try to follow governmental jurisdictions. So you're usually outside --

MEMBER BLEY: So you've essentially got one piece for all of the sites?

MR. MALLON: Yes.

MEMBER BLEY: Okay.

CHAIRMAN POWERS: Yes, all of our early

site permits have --

MEMBER BLEY: Something like that.

CHAIRMAN POWERS: -- that and can potentially take advantage of it. Yours, I think, is the only completed integrated emergency plan that we had.

MR. MALLON: I'm not sure what North Anna did.

CHAIRMAN POWERS: Maybe North Anna did. Yes, I mean, you do generate the operator scram scenario with this situation. But I don't think we've ever encountered really anything negative. And lots of positives about it because when a guy comes in and tells us we'll use this hospital for treating people, you know it can because --

MR. MALLON: Because we do it.

CHAIRMAN POWERS: -- it's already been set up to do that.

MEMBER SKILLMAN: Let me ask a question, going on Dr. Bley's question. When I did the review, I reviewed all the material that Quynh put out for us. I was struck in the emergency planning section, I realize you're doing 2.1 and 2.2 today. But let me ask the question based on Dennis' question.

Here it is in your emergency plan an

agreement between Steve Miltonberg and the State Police in 1990, it's an MOU, Memorandum of Understanding. That is provided as the current emergency plan.

And so I guess I have a question as much about the early site permit as Salem and Hope Creek. What is the durability of that agreement?

MR. MALLON: We have updated MOUs with the state both of New Jersey, and then also Delaware. And the State of New Jersey has agreements with Delaware, Pennsylvania and Maryland for mutual aid. So as far as the mutual aid agreements, we are able to get the help from those states. But I'm not sure about the 1990 letter. I know that prior to --

MEMBER SKILLMAN: It's in the documentation that were asked to read.

MR. MALLON: Okay. We can make available to you a more updated --

MEMBER SKILLMAN: I'm presuming that it's updated regularly --

MR. MALLON: It is.

MEMBER SKILLMAN: -- as it is at any other nuke. But I said to myself golly, that is really a dinosaur.

MR. MALLON: Yes.

MEMBER SKILLMAN: I mean, that goes back

a long, long way, many managements ago, and many actually NRC changes ago.

CHAIRMAN POWERS: Well, we went over that in a substantial amount of detail our last meeting.

MEMBER SKILLMAN: Yes.

CHAIRMAN POWERS: And what I, my own perception coming away from it was that there's a fairly active percolation and interaction here that's going on, and a fairly collegial kind of interaction going on because the existing plans also evolve.

And their requirements and changes they make in planning evolve. And there seems to be a cognizance with those evolutions in the local state authorities. So that comes across as a fairly cooperative kind of arrangement here.

MEMBER SKILLMAN: Well, that was my memory, too. But when I was doing the homework for this meeting, I said gee whiz, that's kind of interesting. I had better ask about that. So that's one off my tick list. So at least I've done my homework. Thank you, Chairman, thanks.

CHAIRMAN POWERS: Okay.

MR. ELZINGA: So I'll just follow on Dan and his remarks regarding geography and touch on demography for the PSEG site. With respect to the

application, the residential demography was studied using most recent census data available at the time. That was the 2000 census.

Information from the census was downloaded by block group and projected across the radii and the sectors you see on the figure. That information was essentially updated from 2000 using annual updates data from 2008, and then projected through 2010. And thereafter, county published growth rates were used to extend that projected population out to 2021 and then ultimately 2081. Next slide, please.

The low population zone, the LPZ is an area that extends out five miles from the power block center point. And I think some of the previous figures were very informative, particularly the one that Jamie had out that showed an aerial photo of the site.

You can see that many of the areas within the LPZ are characteristically without population. It is dominated by a central water feature, the Delaware River estuary.

CHAIRMAN POWERS: Now, your two mile evacuation protocol going to be pretty easy to meet.

MR. ELZINGA: Yes. There are no residents within two miles. We got that one covered.

CHAIRMAN POWERS: Your ETE on that is

zero.

MR. ELZINGA: Okay. We put a check in the box. So in addition to water, certainly, there are other lands associated with the Delaware that are inherently open space. These are public lands, they are lands that are owned or managed by the Corps of Engineers, or managed by other public entities like the New Jersey Department of Environmental Protection.

So they are essentially, by nature, low population areas. And I think some of the aerial photos that Jamie showed really demonstrate that very nicely.

I'll make note that the closest resident is 2.8 miles to the northwest. And again, as we said, there are no populational residents within the two mile area. Next slide.

So the population centers were also analyzed and looked at very carefully in conjunction with the guidance with 10 CFR 121. And that guidance basically says that the population center should be one and one third the distance to the outer boundary of the LPZ.

So essentially, that's a 6.7 mile distance. And the existing population centers are essentially Wilmington, which is the closest, it's at

14.8 miles, and Bridgeton to the east, which is 15.5 miles. These are existing population centers.

There was also care given to look at potential for populations or communities to grow to achieve the 25,000 threshold for being a population center. And Middletown fell into that category. Middletown corporate limits are 7.0 miles to the west of the site.

And we looked very carefully at the potential for that population to grow. There was some indication from the comprehensive plan from Middletown that it could grow to be more than 25,000 by the year 2020 I believe, yes.

And we looked very carefully at that, and there is a number of factors that seem to be constraining growth. There's U.S. or State Route 1, which is a four lane divided freeway that is east of the corporate boundary of Middletown. That seems to limit population movement and growth.

The area east of Route 1 is not identified by the comprehensive plan as lands to be annexed by Middletown. And the same area is an area that consists of very low population zoning, or low residential zoning I should say, single family residential.

So all those factors considered, it's our

conclusion that Middletown will in fact remain distant, even if it does grow to be a 25,000 resident community.

MEMBER SCHULTZ: That was the conclusion based upon a read of 2020, or could you apply that out further in time?

MR. ELZINGA: The expectation is that that would be consistent going forward as well because of those kinds of controls. State Route 1 is a freeway type facility. It doesn't allow that sort of ingress/egress that you might expect with sort of population growth and development.

So that's one factor. And then there's zoning controls. Unless those things change, the expectation is that it will remain at some distance.

MEMBER SCHULTZ: Thank you.

MR. ELZINGA: Next slide. The next slide really focuses on the issue of population density. And density was looked at very carefully, and with respect to residential density, the site is demonstrated as being compliant with Reg Guide 1.7.

The graph below illustrates the compliance with Reg Guide 1.7, particularly for the 30 mile radius. And this is showing in the last year of operation, 2081, the population is less than the threshold value of 1,000 individuals per mile. So again, we are compliant with

Reg Guide 1.7.

We also looked at the requirements for Reg Guide 4.7 and NUREG 0800 with respect to resident and weighted transient populations within 20 miles, and are compliant with those guidelines, as well. Next slide.

So just to wrap up, the exclusionary boundary, as we showed, is an area that encompasses part of the Delaware River. It doesn't include any public roads or other transportation features, other structures other than the PSEG site, and is essentially not inhabited by residential uses.

The lands within the exclusionary are owned by and controlled by the PSEG or other public entities. And as we mentioned just recently, the residential and weighted transient population within the area is low, expected to be low over the life of the project. Thank you.

MR. MALLON: We're going to change out some of the folks up here as we move into 2.2.

CHAIRMAN POWERS: By the way, that's just fine and dandy. You know, switching out --

MR. MALLON: Sure, sure.

CHAIRMAN POWERS: -- is great to my mind.

MR. MALLON: Okay. Mike, you start this, right?

MR. LAUNI: Yes. Okay, my name's Mike Launi. I work for Sargent and Lundy. I have over 30 years experience in licensing and radiological analysis. I have Bachelor's and Master's degrees in nuclear engineering from the University of Virginia.

And I have recently worked on Levy Shearon Harris Nine Mile Point Unit 3 and Bell Bend COLAs. And most recently, I worked on the construction permit for the SHINE Medical Technologies isotope facility.

And what I'm going to talk about now is some of the potential hazards in the site vicinity. Okay, as you've seen for the last couple of presentations, it's mostly a rule site with very few people or facilities near the site. The largest basic industrial facility is the Salem Hope Creek reactors.

And the major transportation route is of course the Delaware river. Now, from looking at it, there's no plans identified for a newer, expanded industrial or transportation facilities within the area. And going to the next.

Here is a map of the area. Within five miles, the only facilities are municipal facilities, a sewage treatment plant just northwest of the site over in Delaware, and the Lower Alloways Creek Municipal Township Buildings. And what's there is a vehicle

maintenance facility. So basically within five miles, that's the only thing you've really got with any potential hazards.

And the next figure shows the airports and airways within five and ten miles. And there are a couple of jetways, a couple of visual routes, and then there's a number of slow speed military training routes. These were evaluated as we discussed in March in the Section 3.5 of 1.6 of the SSAR.

And with that, I'll turn it over to Mr. Peterson.

MR. PETERSON: Okay, good afternoon. My name is Bob Peterson. I'm with Sargent and Lundy also. I graduated with both a Bachelor's and a Master's degree from the University of Wisconsin in 1981.

I've been working with Sargent and Lundy since then, primarily doing thermohydraulic analysis. I'm a manager of our group for the design of many of the plants like Byron, LaSalle, Clinton in the Midwest and continued operation.

CHAIRMAN POWERS: For the benefit of the men, because he has a degree from Mr. Corradini's university, we will not hold that against him.

(Simultaneous speaking)

MR. PETERSON: My fellow Badger is

missing.

CHAIRMAN POWERS: There will be no bias against you as a result of your education.

MR. PETERSON: Well, thank you. Thank you. So kind of the first thing is, you know, design basis events are defined as those hazards that if they occur could cause design parameters to be exceeded or cause physical phenomena that could affect operation of the plant.

Four hazard categories are given on the slide here. First one, and by far the most prominent is chemical releases. As every speaker said, the site's very remote. There's really nothing as far as adjacent hazards.

When the reactor technology is selected, some on site chemical analysis will be required and toxicity analysis for control room habitability.

MEMBER BLEY: Nothing coming down the river?

MR. PETERSON: Well, we'll get to that. The river, yes, the river is the hazard. In other words, I'm talking first disposition, stationary hazards, and transportation hazards except for the river. But yes, the river is the primary hazard. Next slide, please.

So this shows again a photo of the site, and in red the river, primary river channel. As previously mentioned, the Delaware River's, you know, the main estuary entrance to the Port of Philadelphia receives several thousand shipments a year. Closest approach is approximately one mile from the center of the channel to the new site.

So to do the examination, we gathered data from Army Corps of Engineer, Coast Guard, and the Maritime Exchange regarding local river traffic. Using this data, we could assess the types of shipments, the type of chemicals that are shipped down the river and look at the mass and come up with a number of shipments expected of each chemical. Next slide.

So the actual analysis that we performed is a combination of deterministic analysis to determine stand off distances for releases from various vessel incidents and probabilistic analysis to tally those deterministics.

A simple equation is given here. The probability frequency of a hazard's R(hazard) is the product of the probability of a spill. Now this is taken from available data from Coast Guard data. The accident rate, we used NUREG CR-66.24 for accident rates, 1.8×10^{6} accidents per mile is in that document.

And then the probability of adverse weather. I'll get in some more details there, but basically it's dependent both on weather parameters and the associated stand off distance. And then finally, the distance of the trip within the five mile band down the river.

Using that frequency for the hazard, and the acceptable limit of 10^{-6}, we determined the number of allowable trips for each chemical. And then we mined the various sources of data to determine the actual trips.

As an example that's give in this table, you can see the binning that we did. Of course, different frequencies for each bin size that feed into our probability analysis, and then stability class. The example that we gave here is for propane, which we selected one for this analysis, and primarily a lot of binning was done for propane.

Sometimes on shipments you'll get information like petroleum products not classified, and propane provides a good bounding value for that analysis. As shown, the stand off distance is here. So if we get stand off distances less than a mile, which it's at 0.9, those are acceptable results, so that's in the left hand corner. And on the right, those are

unacceptable results.

And then those bins fed into our probability equation. When we summed up the probabilities of all of the different chemical releases, we were slightly above 10^{-6}, we were at $2x\ 10^{-6}$. This is the aggregate probability.

So we actually, we went through and we looked at the technologies that were available, and with the data, we came up with conditional core damage probability of $7x\ 10^{-9}$. Next slide.

The integral slide of mine, I'll also mention that we looked at some other hazards. All of these hazards were looked at and found to be acceptable results. These would be the collisions, liquid spills, and radiological hazards.

MEMBER SKILLMAN: Let's go back.

MR. PETERSON: Sure.

MEMBER SKILLMAN: If I can ask things to 27.

MR. PETERSON: Okay.

MEMBER SKILLMAN: I'm imagining a 1,000 foot long LNG tanker, 85,000 tons pushing up river coming in from overseas going up the Marcus Hook.

MR. PETERSON: Yes.

MEMBER SKILLMAN: And if this is from the

channel to the present Salem and Hope Creek, barely a mile.

MR. PETERSON: 0.9, yes.

MEMBER SKILLMAN: 0.9, yes. So now I'm thinking about this large LNG machine. Explain how the probability fits with a vessel that large, that's 100,000 tons, 85,000 tons.

MR. PETERSON: Well, in that example it would have been the greater than 322,000, you know, gallon --

MEMBER SKILLMAN: By orders of magnitude.

MR. PETERSON: By orders of magnitude. Possibly if it's okay, I'm going to introduce one of my colleagues here.

MEMBER SKILLMAN: Let's just --

MR. PETERSON: We'll continue with that example --

MEMBER SKILLMAN: Right. I'm trying to be pejorative. I'm trying to understand --

MR. PETERSON: I understand.

MEMBER SKILLMAN: -- this slide and the probability of that 10^{-9}.

MR. PETERSON: And I just wanted to make one small point, we'll continue with this example. LNG does not come up the Delaware River. There's no

re-gasification facilities on the Delaware. And with the current pricing of Marcellus shale natural gas, it is unlikely that that would happen in the near term. So with that, we'll continue with that example for to be illustrative. And --

MEMBER SKILLMAN: If you would like, you know, we could still --

CHAIRMAN POWERS: Jamie, on the inverse, between now and 2080, is there a chance that you will have LNG coming down the Delaware river?

MR. PETERSON: There certainly is a number of applications in front of FERC for liquefaction facilities. My understanding is they are largely in Louisiana, and that will be happening. I have not heard of any up near us.

CHAIRMAN POWERS: Okay.

MEMBER BALLINGER: Isn't North Anna building something in Virginia? There's going to be a gas export place in Virginia?

CHAIRMAN POWERS: Yes, but not --

MEMBER BALLINGER: No there, then. That's on the east coast.

CHAIRMAN POWERS: I mean, the question is actually the inverse one.

MR. MALLON: It is the inverse one now.

CHAIRMAN POWERS: Because we're producing gas like crazy. And right now, we have a few states restricting that. If they relieve the restrictions in the northeast, then this is not an impossible site for liquefaction and whatnot. But right now, you say that would be just pure speculation because there's nothing on the board now. And it takes a while to put those on the board.

MR. MALLON: Yes. And one of the challenges they have right now with the Marcellus is the pipeline to get it out of Pennsylvania. So they can't even get it out right now. And I didn't mean to -- it's just that particular hazard.

MEMBER SKILLMAN: I'm going to hang on to the question.

MR. MALLON: Sure, sure.

MEMBER SKILLMAN: My classmate was Chief Engineer on the first LNG carrier.

MR. MALLON: Okay.

MEMBER SKILLMAN: And they would clear the harbor when they brought that ship in. I mean, that was no nonsense. I mean, you talk about a dangerous cargo, that is the dangerous cargo.

MR. MALLON: It is.

MEMBER BLEY: Well, just an issue of

process. What if some years hence, there is a facility? How does that work into the licensing process?

MR. MALLON: So when I first started at PSEG as licensing manager, BP was looking at putting in a regasification plant at Crown's Point, north of the facility. And we had undertaken a number of studies of what happens to LNG.

And it doesn't explode, it burns. And it burns back, from when the vapor is released and it catches fire, it burns back to the source and then burns at that location. We looked at, for the existing plants, we looked at that at that time, and now we're getting into what could happen in the future.

But at that time, it was less than 10^{-7} chance for the amount of traffic that BP was going to have going to Crown's Point. So it depends upon how much traffic going up the river, and then if you fall outside the $10^{-7th,}$ no further evaluation if --

MEMBER BLEY: My question was more what kind of oversight would the utility have, and I would ask the same thing of NRC. If things happen that actually change the subset, maybe we do get something at a higher probability, or just to track what's going on so we know nothing is exceeding the hazard.

MR. MALLON: I know we periodically look at what is on the river, because that's our main hazard.

MEMBER BLEY: Okay.

MR. MALLON: I don't know what other licensees do.

MEMBER BLEY: Okay. I don't either, so I would be interested in that. But go ahead.

MEMBER SKILLMAN: I would be curious to the other information you were going to provide. I really am curious about this question.

MR. MALLON: Sure, sure.

MR. ELZINGA: You mean on large releases?

MEMBER SKILLMAN: Yes, you said there was someone else who had some information. I would like to hear it.

MR. ELZINGA: Well, yes. I actually was going to ask about the LNG. That's why I was grabbing Max, because I wasn't 100 percent sure.

MEMBER SKILLMAN: I'm not really taking upstream or downstream. It's the same. It's the same source. And he's right, it burns back to the source.

MR. ELZINGA: Right.

MEMBER SKILLMAN: And if it burns back to the source, you don't want to be where the source is. So I really understand it. So I'm just curious.

MR. ROSS: So, my name is Max Ross. I have a undergraduate and Master's degree in mechanical engineering from the University of Michigan. I've been working at Sargent and Lundy for eight years, and more than half of my time has been spent on chemical hazards analysis. So that's why I'm sitting here.

So we actually look at that question from two different approaches in terms of how chemicals could explode. So it could explode at the ship itself, or we modeled what would happen if you release the gas and it blows towards the site and has an explosion at the site.

MEMBER SKILLMAN: A gas explosion.

MR. ROSS: Exactly.

MEMBER SKILLMAN: An open explosion, I got it.

MR. ROSS: So in both cases, because a full release of a tank just and keeping it as one single continuous gas cloud is incredibly unlikely. So we looked at what the probability of spill sizes was.

So when we pulled information from the three sources that Bob had mentioned earlier, we found that among ship accidents where some chemical was spilled, 93 percent of them were 100 gallons or less, and then another three percent were, I have the numbers

right here, but another five percent were less than 1,000 gallons.

And there was only one accident in the entire database over ten years of data that was larger than the 322,000 gallons. So yes, it's possible, but that was how we narrowed it down to say it's possible that all of the chemical could spill from a tank and disburse towards the site, but from a probabilistic standpoint, it's very, very infrequent.

And when you combine it with the fact that the wind has to also be blowing straight towards the site, we determined that the likelihood was small. So now taking it a step back and going you can have an explosion on the ship, so we evaluated the worst case vessel that we could find that had an explosion on the boat, it actually was about 30 or 40 miles from this proposed site, they had just emptied out an oil tanker coming from the Middle East.

So, and it was 22 empty hulls, empty tanks, and they all exploded in quick succession from the vapor that was still inside the tank because the liquid chemical wouldn't explode by itself.

So we ensured that if that same event had happened right next to the site, then it would not have been a problem, and that's what we determined.

MEMBER SKILLMAN: Let me ask this. We're talking about a ship. Would that same data be applicable if it were a barge shipment?

MR. ROSS: What do you mean by barge shipment?

MEMBER SKILLMAN: The ship itself propelled and can be carrying its own cargo from a port of origination overseas. A barge is pushed or pulled by a smaller craft. And barge accidents are different. That's where the barge gets away, you know, it lodges in the bank of the river or it collides with an upstream or downstream vessel unsuspecting that there's a barge.

And some of the barges are very, very large. And some of the barges are liquid cargos, and some actually carry gaseous cargo. So you can see a barge that has a pair of propane tanks 100 yards long.

MR. ROSS: Yes.

MEMBER SKILLMAN: And so this barge is massive, and it is also carrying a source.

MR. ROSS: An ignition source.

MEMBER SKILLMAN: An ignition and an explosion source.

MR. ROSS: Okay.

MEMBER SKILLMAN: So I'm not trying to be a razzle dazzle here. I'm just saying when you say 10^{-9},

that means something to us. But there are some sources on that river that I seen with my own eyes where I say I'd like to be comfortable. ACRS has not failed to ask that question, because I've been on that river a lot of times.

MR. ELZINGA: That 10^{-9th}, just to maybe put a little more perspective on that, given an explosion and given core damage, what we still didn't include in there is, you know, a radiological release. That's not into that. We've assumed, you know, a probability of radiological release of 1. Again, without having the reactor technologies in that analysis done.

Remember, we were just slightly over, we had $2x10^{-6}$ as the aggregate probability. And just, you know, we had a question from the staff, like, well you're above 10^{-6} and we acknowledged that and looked at a very conservative core damage probability.

MEMBER SKILLMAN: You're above $1x10^{-6}$, not 10^{-6}, $10x10^{-6}$.

MR. MALLON: Yes, that's right. What I thought I heard the question was was about barge traffic.

MEMBER SKILLMAN: Is this conclusion --

MR. MALLON: And so the question, to rephrase it, is the sources of information, the Coast

Guard, the Army Corps --

MEMBER SKILLMAN: Maritime Information.

MR. MALLON: -- Maritime Information, when you gathered that information, was it for both self propelled ships and barges?

MR. ROSS: It did not distinguish. We grabbed the chemicals that were traveling up the river to the Port of Philadelphia independent of the mechanism of them getting there.

And we included the assumption that if a flame, if a vapor cloud is above the lower explosive limit when it gets to the site, that an ignition will occur. We set that as one because there are --

MEMBER BLEY: It's a pretty good bet.

MR. ROSS: Well, I mean, it's a fair bet, yes.

MEMBER SKILLMAN: Yes.

MR. ELZINGA: The maritime data was just a compilation of what goes down the river, not how it goes down the river.

MEMBER SKILLMAN: There's a lot that --

(Simultaneous speaking)

MR. ELZINGA: Yes, correct. Yes, correct.

MEMBER SKILLMAN: Thank you for putting up

with my questions. I appreciate Dr. Bley's interrogation. But when you say the number's low, there is traffic on the river that is carrying cargo that's worth a lot of respect, that's all I'm saying.

MR. ELZINGA: Absolutely, I agree.

MEMBER SKILLMAN: Thank you.

MEMBER SCHULTZ: To address Dennis' earlier question, it might benefit the Committee for the Staff to come back with information related to the updates that current licensees do to their emergency plans based upon changes to facilities in the near distance region to the sites, as well as the barge distance regions to the site because those are done, those reviews are done periodically, and more information related to that would be helpful. Or the Applicant could bring it, also.

MEMBER BLEY: I think it's the only thing I'd hang on here. The thing Dick brought up, I used to live on the river and actually saw barge accidents where a barge broke loose. And you're no longer constrained to the channel out there if that happens.

Now looking at the path, it seems pretty unlikely it's going to drift over to your shore, but I don't know if you thought about that at all. And I don't know what's on barges going up and down that river

either compared to -- ships are going to be out in the channel for sure, but the barge could come either way.

MEMBER SKILLMAN: I was involved in this --

MEMBER BLEY: It's probably real low probability.

MEMBER SKILLMAN: -- in a plant that we designed and built in Germany. And the concern there was the Vulcan explosion, the gas cloud explosion. And there was a pair of propane tanks on a barge. And the presumption was it did get loose, and the vector under the spherical containment was KPS and six or seven or eight orders of magnitude.

And what happened was you ended up with a brand new seismic event, injured the concrete, that it reset all of the accelerations for the plant. So you had this huge burn, you had this rarefaction wave, but you had this enormous ground motion and building motion as a consequence of the shockwave.

And so we had to re-do the seismics. And so I think I understand what the cargo is, what the cargo can do and how injurious it can be to the site. So this is more than just that flame, flame propagation, heat type of an event. There are some other issues related to how strong an explosion can be with a cargo like this

that are stunned. Thank you.

MR. CHOWDHURY: So let me understand this. Dr. Schultz, you would like to have a response from the Staff regarding the impact of any change of information in this area on the emergency planning and associated --

MEMBER SCHULTZ: Well, the question came up related to the control or the information flow if new facilities were being proposed, an LNG facility was being proposed. How would that be, how would the site be advised of that? And how would that be taken into account with regard to any future planning in terms of emergency planning or other evaluations?

And that's currently done. And so it would help to refresh our understanding of how that is done with current licensees.

MR. CHOWDHURY: Okay, thank you.

MR. MALLON: And with that, we're done. So Prosanta? Okay.

(Simultaneous speaking)

CHAIRMAN POWERS: Okay, we might want to go ahead and take a break here.

MR. MALLON: Okay.

CHAIRMAN POWERS: I just remind members that we're presuming a strategy that we did the last

time of just alternating the presentations because I think that worked out extremely well. And we can focus on things, in fact, I thought that was an innovation in ways that Coleman and Prosanta came up with that was just terrific, by the way.

And I recommended it among other things that we did, by the way. So let's take a break until 20 of, and then we'll come back.

(Whereupon, the above-entitled matter went off the record at 2:22 p.m. and resumed at 2:38 p.m.)

CHAIRMAN POWERS: Let's come back into session. So I said we are going to do these presentations in a kind of a parallel channel fashion. And that will apply again tomorrow because we find it an effective way to compare what Staff has done to what the Applicant has done.

MR. CHOWDHURY: Okay. Well, I have with me Seshagiri Tammara Rao. He is the principal contributor to Chapter 2, Sections 2.1 and 2.2. And on this slide you see the ADAMS session number, the publically available document.

Now, Rao is going to introduce himself and talk about his experience, et cetera. And then before starting the formal presentation, I think he would like

to share, and we discussed it at the break, a little bit in terms of responding to Dr. Schultz' question on the process of how, you know, changes can be captured. So with that, I turn to Rao.

MR. TAMMARA: Yes. My name is Seshagiri Rao Tammara. Everybody calls me Rao for simplicity. I have three Master's degrees, two in chemical engineering and one in environmental engineering. I have one from India, two from University of Maryland.

I joined the workforce in 1974 with NUS Corporation. I worked there for 32 years, and then switched to NRC in 2006. Since then, I have been working on all 12 COL applications for the Chapter 2.1, 2.2 as well as 3.5 Aircraft Hazards.

Prior to that one, I worked on many of the original power plants for a consulting company as a contractor or whatever writing the ERs. And for DOE a lot of EISes and some space accidental scenarios and FSARFs. So that is my basic experience.

With respect to the question, we don't have a regulatory requirement once the license has been given to update what will be the external hazards later on on a periodic basis.

At one time, I think IEEE evaluations were performed about six or eight years ago, and they

concluded looking at various plans, and they put a report. Everybody knows that.

But only requirement is if a big industry or a new proposed facility comes into being, there are state and some other agency requirements like an EPA or a FERC, depending on what the facility, or FAA if it is an airport. And probably Navy or whatever, depending upon the situation, that particular state and the other agency how to issue the license.

And there as a part of that requirement, they have to evaluate the safety of the nearby facilities, how the proposed facility will effect the nearby facilities. So as a part of that one, they are supposed to evaluate and get the license.

MEMBER BLEY: Who's the they in what you just said?

MR. TAMMARA: Pardon?

MEMBER BLEY: Who's the they?

MR. TAMMARA: They means other agencies.

MEMBER BLEY: Other agencies?

MR. TAMMARA: Because --

MEMBER BLEY: So not sort of an implicit assumption --

MR. TAMMARA: NRC doesn't have the regulatory requirement to ask the proposed facility,

or the facility who is proposing to analyze this one or whatever. But as a part of the license from the other agency, whatever state, whichever state it is being proposed, so they will have the requirement. But it has to look at it.

MEMBER BLEY: But we don't do that initially. Initially, we look at anything that's there.

MR. TAMMARA: But that is the -- before we do the license, we are looking at whether the --

(Simultaneous speaking)

MR. TAMMARA: Right. Once the licensee is given, there is no regulatory requirement or so far to look at the area. However, for the emergency planning, there is a requirement that every five years, they will update the information. Right.

MEMBER SCHULTZ: That's what I was referring to in addition to what you've said.

MR. TAMMARA: Right, right. But --

MEMBER SCHULTZ: Which comes from the outside in. There's also the expectation from the inside out if you will that every five years, the look see of what is around the site, and I just wasn't sure how far that went out. I know it goes out ten miles for sure to evaluate facilities that are in that reach.

(Simultaneous speaking)

MR. TAMMARA: Yes, but from the emergency point of view, it's not from the external hazards point of view. That's the key.

MEMBER SCHULTZ: Okay.

MR. TAMMARA: But however, the --

MEMBER SCHULTZ: But some of that does have an impact on the emergency plan itself.

MR. TAMMARA: Maybe. But it may not be significant. But the language is there. If the applicant is aware of the significant information, if they think it's significant, they are supposed to volunteer and evaluate.

That information or that sentence is there in the regulatory requirement. But it is not like a should. Yes, so there is a little bit of it is not a requirement, but it is a suggestion or whatever it is. So that is one thing.

But however, there is another point we'll have to keep in mind. Any stakeholder can petition, there is a facility then NRC take a look at it. Of course, we are obligated to take a look at it and evaluate.

MEMBER SCHULTZ: Right, right. But here in this forum, what brings this to bear is that we are

looking at the external hazards. And at the same time, we're all thinking, you, and the Applicant, and we are thinking about the emergency planning aspects associated with that and how it might affect the site and the facility in any way associated with what accident evaluation, we're using some of the same techniques and so forth. So it's interesting that we do that in the application, but we don't continue that in a strictly formal way forward in operation.

MR. TAMMARA: It is the way it is right now. But sometimes --

MEMBER SCHULTZ: But there are ways to make it happen is what you're saying.

MR. TAMMARA: Right. But 50.59 also sometimes they will make an amendment to request or whatever they can include. Just like Indian Point now proposing a 32 inch pipeline, natural gas pipeline. So the applicant is performing a 50.59 as a part of.

But that is the status of the regulatory information, regulatory status.

MEMBER SCHULTZ: Great, thank you.

MR. TAMMARA: So I just wanted to clarify how it is.

MEMBER SCHULTZ: I appreciate the prompt update. Thank you.

MR. TAMMARA: So I reviewed the information pertaining to 2.1, geography and demography. The requirements are the site location description has to be addressed in 2.1.1.

The Applicant has provided the information, and we have independently looked at the information and confirmed that the information addressed is correct to the best of our knowledge. And it is addressed appropriately and adequately.

Therefore, Staff finds the Applicant has addressed the information adequately and is acceptable in meeting the requirements of 10 CFR 52.17, 10 CFR Part 100.3 and also the radiological consequences evaluation factors specified in 10 CFR 50.34. Next slide, please.

In 2.2, exclusion the area and control have to be addressed. Legal authority, control of activities unrelated to the plant operation, arrangement for the traffic control in the case of emergency have to be addressed more fully.

In the absence of ownership and control at the ESP stage, the applicant proposed a condition, including SSAR regarding the planned acquisition of 85 acres of land as well as full control of legal authority from USACE, which controls the Federal Government land

of 146 acres.

But in that address, they have not clarified very clearly how they will regard the control. Therefore, Staff felt that we have to put some permit condition to specify to get the information how they are going to have the full ownership or full control in future in acquiring those 85 acres of land.

Therefore, we have imposed a Permit Condition 1 which is specified as displayed on Slide number 14. Applicant must complete acquisition of 85 acres of land, including mineral rights, from USACE that is currently part of the confined disposal facility north of the site.

Similarly, applicant must modify existing PSEG Site Radiological Emergency Response Plan and Security Plan, and reach agreements with USCG, and also extend the protection for Delaware River portion from the existing Salem and Hope Creek Exclusion Area to cover Delaware River portion and the Exclusion Area related to ESP.

Applicant must reach agreement with USACE for any land within EAB that will not be owned by the COL applicant to obtain legal authority from USACE either allow COL applicant and its surrogates to determine all activities including exclusion or

removal of personnel and property from the area or require that USACE exercise that control in a specified manner.

So this is spelled out very clearly so that they will have the control at the time of license.

CHAIRMAN POWERS: Did you put this on as a COL --

MR. TAMMARA: Yes.

CHAIRMAN POWERS: -- rather than the early site permit?

MR. TAMMARA: No, condition will be specified in ESP.

CHAIRMAN POWERS: In the ESP.

MR. TAMMARA: But, you know --

CHAIRMAN POWERS: It's applicable in the COL.

MR. TAMMARA: Right, because it is not still completed, yes. That's why we have to impose that one. Staff finds --

MEMBER SKILLMAN: Let me ask this please, and it would be to PS. In this permit condition, the verbs are future tense, will, and apply to the Coast Guard and to the Corps of Engineers. What is the down side? What would it be that would cause either the Coast Guard or the Army Corps of Engineers to renege

or to balk for those conditions?

MR. MALLON: So for the Army Corps, that's the easy one, we have an agreement in principal to do the land exchange. And we're actively working on that. We've acquired and we've spent $19 million, or $17 million for the property and the engineering for the exchange property.

So I'm confident by the middle of next year, we should be done with that. So the Army Corps is easy.

MEMBER SCHULTZ: And it will include the condition here for mineral rights?

MR. MALLON: Yes.

MEMBER SCHULTZ: I mean, the full acquisition?

MR. MALLON: We'll own the land, so that one's easy. The Coast Guard, my understanding is they have that obligation to help control the river in front of our site. We can work to get that. I don't know how hard that is sitting right here. I have to go find that out.

I'm sorry. We can come back and if we can talk about that either, maybe have an answer for you tomorrow on the Coast Guard piece.

MEMBER SKILLMAN: I would like to have an

answer to that because I can see the Coast Guard's side of this saying you want me to bring another patrol boat out, you want me to bring out another set of choppers? What is it that you're really asking me to do?

MR. MALLON: The exclusionary boundary is established. It's the area that after an emergency is declared, within two hours, the licensee has to clear people from that area. So it's not a Coast Guard, have a patrol boat here 24/7/365.

Rather it's when if we needed that, they would be, the New Jersey State Police I believe is how it works for Salem and Hope Creek. We would notify them, they would notify the Coast Guard and the Coast Guard would help clear that area.

MEMBER SKILLMAN: I understand the concept. I'm just remembering back 35 year ago watching the National Guard trying to clear parts of Pennsylvania at TMI-2. And I recall the complexity that that introduced. And I think we're smarter now. The agencies work together --

MR. MALLON: Better, yes.

MEMBER SKILLMAN: -- much more tightly and in a much more coordinated fashion now. But asking the Coasties to jump in and do something, now you're messing with security and National Defense. And here we are

talking about an early site permit. This has to go forward 20 years.

MR. MALLON: Yes.

MEMBER SKILLMAN: So I'm saying I'd like to know more about that.

MR. MALLON: Yes. And we'll get you that answer.

MEMBER SKILLMAN: Okay, thank you.

MEMBER SCHULTZ: It looks like it may be covered by current agreement.

MEMBER SKILLMAN: It could be.

MEMBER SCHULTZ: Just maybe not formalized.

MR. MALLON: That's just what I think.

MEMBER SKILLMAN: Maybe how they control the river and how they --

(Simultaneous speaking)

MEMBER SCHULTZ: If we can hear more about it, that will help settle it.

MR. MALLON: Yes.

MEMBER SCHULTZ: Thank you.

MEMBER SKILLMAN: Thank you.

MR. TAMMARA: Staff concludes that the subject to the Permit Condition 1 and resolution of some Confirmatory Item, applicant's designated exclusion

area meets the requirements of 10 CFR 50.34(a)(1), and 10 CFR 52.17(a)(1), 10 CFR Part 100 also in determining the acceptability of the PSEG Site. Next slide.

Population distribution. The population distribution projected to next 60 years is presented by the Applicant. And Staff has made a confirmatory analysis using the 2000 census as well as the state projected population projections and calculated independently the projections.

And those projections and population numbers are comparable. And also, staff calculated the density within 20 miles from the site, and also checked the population center distance.

Originally the population center projected to the later date. Middletown was not addressed. But looking at the projected population and those things, we have identified that one to be addressed, and Applicant has gave a detailed presentation, calculated the density, and gave an explanation of zoning and everything, and addressed and satisfied the requirements to resolve the issue at the present time.

And also, it seems the addressing analysis is acceptable and reasonable. Therefore, presently Wilmington will be the closest population center.

Staff finds that the applicant has provided sufficient and acceptable description of the current and projected population distribution, low population zone, population center distance, population densities in and around PSEG Site, and the information meets the regulatory requirements specified in 10 CFR 50, 52, and Part 100. Next slide.

Applicant has provided all the locations and the distances and nearby facilities within the five miles from the facility. And Staff has also looked at independently and verified the facilities and agreed the information presented is acceptable and reasonable.

Staff reviewed the applicant's information pertaining to the location and description nearby facilities and concludes all potential hazardous activities on site and in the vicinity of the plant have been identified according to the information required and meets the requirements of the regulatory conformance 10 CFR 52, and also 10 CFR 100.20 and 21.

Evaluation of the potential accident. In the evaluation of the potential accidents, actually the design basis accident is defined as the probability of an event exceeding 10^{-6} with a radiological consequence exceeding that is specified by 10 CFR Part 100 or 50.34.

So there are two conditions that will be met, first is the accident, and also the release of radioactivity not exceeding the 50.34 should be less than 10^{-6}. So that is the designed basis accident probability.

The other explosions and everything, we have an evaluation for whatever they have. The major emphasis was on the transport of the barges and the waterway.

And we closely looked at that analysis, reviewed, and also independently calculated there were some miscalculations in the beginning because they have identified the probabilities on a discreet basis.

And the regulatory requirement is we have to look at the total probability should be less than 10^{-6}. So the Staff identified it is not the right way, so we identified with the applicant. We are able to find the problem, and they help correct it. They recalculate it, and the probability was little higher than 10^{-6}. That is the accident probability.

Therefore, they have chosen if the accident occurs with that probability, the likelihood of release, radioactive release, taking into account the potential design basis designs, the lowest probability they have taken, and then they have showed

even the accident is little higher by applying the conditional core damage frequency of the particular design, the CDF will be acceptable.

So therefore, it meets the requirement of 10^{-6} design basis because the accident plus the radioactivity release is lower than 10^{-6}. So that way, the probability calculation was considered acceptable and reasonable.

Therefore, in the final conclusion, the applicant determined the minimum safe distance for the transport that was acceptable. In addition, there was another calculations for the gasoline, truck and the delivery.

They have calculated the minimum safe distance for the potential explosion. And that minimum distance did not meet the actual distance from the transport route. Therefore, what they have proposed in the SSAR is during construction, they will relocate the pathway or route.

Since they have committed to the relocation, we thought that we should put a permit condition when they are relocating. One they have relocated, they have to reevaluate at the time of COL to make sure that the route meets the 1 PSI minimum safe distance requirement.

And since presently it is not meeting and they committed to relocate, we said it has to be done at that time. Then only the license will be granted. Therefore, we drafted a permit condition, another permit condition for that issue.

The permit condition is displayed on Slide 21. A COL applicant referencing this early site permit shall demonstrate that the nearest structures, systems, and components important to safety to the selected plant design can withstand the effects of potential explosions associated with the relocated gasoline storage tank and the gasoline delivery tanker truck.

The applicant shall demonstrate this by using the methodologies provided in Reg Guide 1.91 and Reg Guide 1.78 for the direct explosion and also vapor cloud explosion respectively to confirm that a minimum safe distance exists between the nearest plant SSCs important to safety and the relocated gasoline storage tank and the gasoline delivery tanker truck such that the SSC would not experience an over pressure in excess of 1.0 psi in the event of an explosion.

So this is the second permit condition which has been imposed for this section.

Since the technology has been selected,

not selected, there are some on-site chemicals or some other chemicals the plant uses are undetermined at this time.

Therefore, once the technology is selected and the storage of whatever the chemicals they use, those should be evaluated from the external hazards point of view, as well as control room habitability point of view because the control room habitability has not been designed that well. We do not know the distances.

So that is all, it is not a permitted condition, but it is a COL action items, those have to be addressed in the COL application. So those are the two COL action items which we have identified and indicated in the application.

MEMBER SCHULTZ: So this is routinely not a part of the envelope process?

MR. TAMMARA: Right. That's correct.

MEMBER SCHULTZ: That the process would expect that this would be done later?

MR. TAMMARA: Correct. Based on the review of the Applicant's information and analyses related to site the specific evaluations of potential accidents, and staff's independent confirmatory analysis, staff finds the applicant's conclusions to

be consistent with the guidance provided in NUREG-0800, Section 2.2.3, with an exception of potential impacts from gasoline storage tank and gasoline delivery to the storage tank at Hope Creek Generating Station.

Staff concludes that subject to the Permit Condition 2, the ESP applicant has been established, site characteristics and design parameters acceptable to meet the requirements of 10 CFR 52.17, 10 CFR 52.100 20 and 21 in determining the acceptability of the proposed PSEG Site.

MEMBER BLEY: Rao, could I take you back to Dr. Schultz' question? Is there a particular reason why there wasn't a parametric selection of concentrations so that the toxic chemicals would be within the enveloping basis, or is that just --

MR. TAMMARA: No. Only pertaining to the on-site storage.

MEMBER BLEY: Right.

MR. TAMMARA: Yes --

MEMBER BLEY: I meant for control room habitability. It could have been part of the envelope process. I was just wondering why it wasn't.

MR. MALLON: For R, when we looked at this, and it's similar for radiological accidents, a LOCA, what's the control inhabitability? The orientation of

the plant, the control in air intakes across four designs and spinning it 360 degrees around, that wasn't something that we chose to undertake.

MEMBER BLEY: Chose to do. Okay, that's fine. That's fine.

MR. MALLON: Sure.

MR. TAMMARA: Any questions?

CHAIRMAN POWERS: Neither Hope Creek nor Salem uses chlorine?

MR. MALLON: They use chlorine on circ water, but I don't know that it's in, you know, large enough quantity to cause a hazard. I previously worked at Limerick and there's occidental petroleum and a railroad that goes by.

CHAIRMAN POWERS: Oh, yes, yes.

MR. MALLON: They have chlorine monitors and SCBAs. And you know, that's part of their design basis.

CHAIRMAN POWERS: Okay. We're all set to move to meteorology, I think?

MR. TAMMARA: Thank you.

CHAIRMAN POWERS: Thanks, Rao.

MR. MALLON: Okay, so Mike and Erwin? So actually, Dr. Prater, I think you start off, right?

MR. PRATER: Okay, I guess I start off this

session. Thank you. My name is Erwin Prater. I am currently a meteorologist and atmospheric scientist at Sargent and Lundy in Chicago.

Just a brief resume. My experience, I've been in the weather forecasting analysis business about 25 years. During that time, I spent several years with NASA on some of their high altitude and low altitude forecasting.

I spent seven years at the Army working with a meteorological tower network very similar to what you have in a nuclear facility. And I also spent two years with a natural gas company in Oklahoma where we applied, or attempted to apply climate models to our short and long term financial positions for our trading desk.

On the academic side, I have a Master's, PhD atmospheric science University of Wyoming. I have an MBA University of Arkansas. I'm also a charter financial analyst.

And if you have no questions on that, we'll go ahead with the slides. We'll go ahead and skip that since I introduced myself. The data sources, this slide just provides an overview of the raw tools, the raw data tools that went into it.

I won't read the whole slide, just hit the

high points. We used hourly wind, precipitation, temperature and humidity readings. Those are primarily from airports, national weather service stations, as well as some military installations.

We also used daily maximum temperature and precipitation, not forecasts, but observations. And those were from cooperative observers, what we call COOPs for short. One thing I want to point out about COOPs, this comes up, is that COOPs measure daily maximum temperature and precipitation.

I didn't include humidity on the list because they don't measure it. So if there comes a case where we have to use a temperature, a dry ball temperature reading from a COOP, we have to go get that corresponding humidity reading or coincident value from another source. So I just want to put that up front.

And continuing with the slide, we also looked at published data summaries guidance, as well as the NRC guidance. Next slide.

MEMBER SKILLMAN: How far back did you observe your data, please?

MR. PRATER: As far back as we could. And some of those COOP stations went back I believe to around 1893 or so. So it was over 100 years. And our

general philosophy there was go out and get as much data as you could for as long as you could.

MEMBER SKILLMAN: Okay, thank you.

MR. PRATER: And going on to site characteristic values, the entire table is in SSAR Table 2.0-1. I'm just going to hit some of the high points here.

We identified record temperatures, which we took as an approximation of what we call the zero exceedance values. We identified a record high, record low temperatures, and a mean coincident wet-bulb that was coincident with that record high temperature.

And that's where we had to use the COOP station from Marcus Hook to get that 108 Fahrenheit, which is a record with a wet-bulb reading from a station at Wilmington, Delaware and combined the two.

We also looked at 100 year max and minimum temperatures using ASHRAE technique, in their 2009 edition, and that was based on stations with relatively long digital records. Again, the longest period we could, and that was from Dover, Millville, and Wilmington. Next slide, please.

MEMBER SKILLMAN: Before you change.

MR. PRATER: Sure.

MEMBER SKILLMAN: If you had developed a

statistical model with a distribution entails, how much different would a statistical model give in terms of high and low compared to the 108 degrees Fahrenheit from Marcus Hook and the 18.7 Fahrenheit below 0 at Wilmington?

In other words, if you took this data, turned it through, made a statistical distribution and added uncertainty, by how much would that 108 be exceeded on the high side and by how much would the 18.7 below 0 be exceeded on the low side?

MR. PRATER: See, we actually didn't go out and do that computation. Let me get back with you on that, maybe I can give a little more reason.

CHAIRMAN POWERS: Well yes, I mean, it's almost an impossible question to answer until you specify at what confidence level.

MR. PRATER: Right.

MEMBER SKILLMAN: I mean, if they got 100 years of data, it would seem that there is a large amount of information that could be used for a fairly simple calculation.

CHAIRMAN POWERS: It is never a simple calculation. You do end up having to say at what confidence level.

MR. PRATER: Right.

CHAIRMAN POWERS: And, I mean, okay. You don't really have an answer to that, do you?

MR. PRATER: No, I don't.

CHAIRMAN POWERS: I mean, there's no engineering answer to that question.

MR. PRATER: Right, right. And what we tried to do is to get as much data as you can for a longer time period and get as big of a sample you can to try to at least so you can make those confidence intervals as small as possible. So that's really, I guess, the best answer I could give you.

CHAIRMAN POWERS: I can't imagine how horrible it must have been in Dover at 105.9. Do you happen to know when that occurred?

MR. PRATER: The wet-bulb in Dover? Or the, which question --

CHAIRMAN POWERS: It's the --

MR. PRATER: The one down? I would have that information, I don't have it in front of me right now. But if you want, I can get it.

MEMBER SKILLMAN: No, I wasn't trying to be razzle dazzle there. I was just curious.

MR. PRATER: It would be terrible.

MEMBER SKILLMAN: So we're looking at 20 years, we're saying here's kind of the meteorology that

we would expect at this site. There have been some remarkable weather events at that site.

MR. PRATER: Yes.

MEMBER SKILLMAN: Particularly in terms of precipitation, ice, that type of thing. And so we sit here today saying here is an ESP that, you know, they've asked for 20 years. Give us a permit, between now and 20 years from now we can start to think. So why should we think these numbers are bounding?

MR. PRATER: Well, what we're trying to do here is we're going out and identifying the worst, really these are extreme conditions when you think about it, 100 year conditions. And so we're really going out, I think if you think about the site overall it's not excessively windy and it's not excessively cold and it's not excessively hot.

And so I think we're looking at some pretty extreme conditions here when we start looking at 100 year numbers. So we're really, our thinking on that is because of where the site is, and we're dealing with some pretty extreme, like you say, that 105.9 at Dover, that's pretty real conditions, that we're thinking that's going to be representative of really your extreme cases near term.

MR. MALLON: I think the other thing to

think about here is these are the site characteristics. When I go do to a COLA, I'm going to look at the site characteristics versus the site parameters that the reactor vendors have prepared.

I'm not going to redesign the plant because it's designed for 120 degrees and -35. I'm not going to change the plant design. So I'm going to, by the very nature of what happens at a COLA, have additional margin.

And I'm saying numbers off the top of my head, I don't know what the reactor, the site parameters are for the different reactors. But there is, at the next stage when I come back to the NRC, I'm going to do that comparison in a COLA and we'll see where the margin is.

MEMBER SKILLMAN: Fair enough, okay. Thank you.

MR. PRATER: You're welcome. Next slide, please.

CHAIRMAN POWERS: Yes, one of the problems is the way the rules are written is what they've done is what they're required to do. Okay, turning it into a distribution, it's very likely if you took a 90 percent confidence level, 108 degrees at Marcus Hook would be outside your 90 percent confidence interval.

MEMBER BLEY: I mean, you used 100 years, over 100 years worth of data in some sets?

MR. PRATER: Yes, correct.

MEMBER BLEY: I'm a lot more comfortable with this than with somebody who's got 20 years of data and does I don't care what kind of analysis.

MR. PRATER: Again, we're trying to go out and get as much as we can for as long as we can. I think those are the take-aways there. And continuing on with the table, again just hitting the high points here, we looked at the UHS ambient air temperature and humidity, which the highest one day, five day, thirty day, running average, wet-ball temperature, dry-ball temperature.

Again, those were taken at stations that had a long period, a long time series of hourly data, and that was Dover, Millville, and Wilmington in our area. And I have the values up on the screen, you can see them.

The basic wind speed, 100 year value which came from ASCE guidance. Hurricane wind speed, that was extracted from Reg Guide 1.221, and the tornado characteristics, that came from Reg Guide 1.76. Next slide.

And just, this is the last three slides that talk about the site characteristic values. For

the winter precipitation, we identified the 100 year ground level snow pack from ASCE standard. The 48 hour PMP, that's from a NOAA hydrometeorological report. And we used ISG guidance for the extreme winter frozen precipitation and the normal winter precipitation. Next slide.

I'm going to shift gears a little bit. The preceding slides talked about the data sources and also what was in the SSAR table. Now we did get a little bit more of what's going on at the site.

Our primary data sources for this piece were the primary on-site tower, that's a 300 foot tower that's outlined in SSAR section 2.3.3. We looked at data from a 32 year interval. Again, we did this analysis back to 2009 time frame, so our complete years were up through 2008.

So we looked at a 32 year period as well as a three year period contemporaneous as part of that. And we looked at our regional weather stations, too.

As mentioned in subsection 2.3.2.2, we looked at historical on-site dry-ball temperature, wind, precipitation, and found that the data from the on-site tower were consistent with the observations we saw at the regional stations, which gave us some comfort level with what was being measured at the site to see

how consistent that was with overall weather patterns in the area. And we were comfortable with that.

We also took a look at the frequency distribution of Pasquill stability class in the on-site tower for a three year period, and a 32 year period. And that involved looking at the wind speed in one direction as well as the delta T, and in joint frequency table.

And we found that three year, 32 year period showed similar distributions, and that is shown in SSAR Table 2.3-26. Next slide, please.

Talking now about the tower, the plan is to use the current primary tower and backup towers to support the new plant. And in the lower right hand corner of the screen you see a picture of the 300 foot primary tower in the background, and the 33 foot backup tower, 10 meter tower in the foreground.

The primary tower's been in operation for more than 30 years. It's a 300 foot latticed design. It's located approximately 5,500 feet southeast of the new power plant area, and we're expecting that that would be too far to be affected by the structures.

Instrumented at the 300, 197, 150 and 33 foot levels, the instrumentation, I just want to add, is described in SSAR Table 2.3-28. And due to upgrades

that were made in 2008 I believe, the instrumentation now meets Reg Guide 1.23 Rev 1. Next slide, please.

Overall, we expect the existing towers to be adequately exposed for intents and purposes of air dispersion modeling. The towers are sufficiently far from the new plant to minimize building wakes.

The local topography, as I think I've indicated in some of the earlier slides, is flat and relatively without significant vegetation. I do want to add there is a short, about 12 foot tall, instrumentation shed by the main tower. That's to house computer equipment, standard equipment for these types of installations. That building is too short to affect the lowest wind measurements.

We looked at the joint annual data recovery, JFD, joint frequency distribution at 33 foot level, wind speed direction and the delta T. And for the three year period of interest, 2006 through 2008, that exceeded 95 percent which exceeds the 90 percent criteria in Reg Guide 1.23. We're very pleased to see the high quality data from the tower.

Next slide please. And I think with that, Mr. Launi?

MR. LAUNI: Okay, this is Mike Launi again. What I'm going to talk about now is the short

term or accident diffusion estimates that were done. We used the chi over Q, short term chi over Q's were calculated using the three years of site meteorological data.

And we used the PAVAN computer code to calculate the chi over Q values. Next slide, please. And this shows the site, again what was shown earlier. The EAB is a PPE for all of the layouts. And we got an EAB at 600 meters which is measured from the corners of this common PPE site layout. Next slide please.

The calculation, you can either use the higher of the 0.5 percent sector chi over Qs or the five percent site chi over Q. The higher value was for the 0.5 sector dependent chi over Qs, that was used.

Results are shown here for both the EAB and for the LPZ. All of the chi over Qs were below the DCD chi over Qs for the four reactor technologies. And I know at the last, in the March meeting someone had brought up the question about the uncertainty in the chi over Qs.

And per Reg Guide 1.145 Section C.4, you have to consider the uncertainties if your instrumentation does not meet the requirements of Reg Guide 1.23. And as Dr. Prater just said, the instrumentation at the site does meet Reg Guide 1.23.

Next slide.

MEMBER SCHULTZ: Can you give a feel for how much margin you have to the DCD chi over Q?

MR. LAUNI: In the case of the, okay, for the zero to two hours, the EAB which is 4.71 times 10^{4th}, for the four technologies, AP1000 was 5.1x-^{4th}, APWR was 5.0x10-^{4th}. So then the ABABR was 1.37x10^{-3rd}, and the EPR was 1.0x10^{-3rd}.

In the case of the LPZs, they are all, all technologies were at least an order of magnitude higher. So there was a considerable margin there.

MEMBER SCHULTZ: Thank you.

MR. LAUNI: Okay, moving on for Section 2.35 is the long term or routine diffusion estimates. Again, we used the three years of meteorological data to determine the chi over Q.

And we used the NRC sponsored chi over Q, D over Q computer program to do that calculation. And basically, then followed the NRC guidance on doing the calculations for chi over Qs at the nearest resident, nearest farm, et cetera.

CHAIRMAN POWERS: Thank you. Jamie, I'll just mention, we'll probably need copies of these slides for the record.

MR. MALLON: Sure.

(Simultaneous speaking)

MR. LAUNI: We have them. I apologize.

CHAIRMAN POWERS: Just to keep our accounting of this material.

MR. MALLON: I'm sorry. At the break, we should have gotten them out to you.

CHAIRMAN POWERS: Any questions? But I have a question just because you introduced yourself saying that you had spent 30 years looking at meteorology stuff and things like that.

We have a lot of prognostications appearing both in the literature and in the news media about how future evolutions in climate are going to -- have you looked at sort of stuff to see how it affects this particular site?

MR. PRATER: Well, let me give you the big picture to try to answer your question. In a past corporate life, I worked on the energy trading floor. And as part of that particular outfit, we had our own climate models that we had licensed with various research universities.

And I think in a fit of hubris for lack of a better term, we attempted to take those climate predictions and then work them into our, basically our economic models for our trading operation. That's

where my business background came in as well as weather.

And we found that, even this was about ten years ago so things may have changed a little bit, but even with the global climate models we had then, they're very sensitive to how you tune them.

CHAIRMAN POWERS: Yes.

MR. PRATER: Yes, very sensitive. And you're dealing with models that have about 100 kilometer, about 60 mile resolution. So between here and New York City you have about what, four grid points. There's a lot of weather that occurs between here and New York City, as we all know.

CHAIRMAN POWERS: Absolutely.

MR. PRATER: And so you have to tune these models then to basically calibrate them in different conditions. And we found that really because of the sensitivity of the models, that --

CHAIRMAN POWERS: You're getting the answer you --

MR. PRATER: Well, we really couldn't use them in an economic sense. And I'm envisioning now having a red Corvette and being at a beach somewhere having been able to get that to work. So we failed miserably.

But I think we learned a lot about what you

can and can't do with the global climate model. And I think that would apply, then trying to take that and boil it down to say a narrow point, a very small site like PSEG or any other point prediction.

And let me expand on that a little bit more. I think historically about tornado forecasting, say at the end of World War II. It came back we had a lot of experience going from the war in forecasting.

And we knew the general conditions for severe weather. We knew maybe a multi-state area which areas might be favored for severe storms. But it really wasn't until maybe the '70s into '80s when we started to get the radar as well as then we dealt with what's called an LFM, limited fine area mesh model.

When we started to get better models, we could make more specific forecasts. And in a past corporate life, I was also a forecaster for utility companies.

We're now at the point with our forecasting models where I could give a utility a call say on a Monday, say look out for severe weather in your climate area on Friday, give you a call again on Wednesday, maybe narrow it down to the lower half of New Jersey, and then call you Friday morning and say these are the particular parts of your area or counties and power

poles you're going to have to worry about.

But that specificity didn't exist at the end of World War II. And I think that's kind of where we are with climate models now. There's a lot of work being done, I think a lot of it's very good work.

I think we're learning that yes, indeed the science is settled. The science is saying that climate changes, and I think we've shown that. But we're not to the point yet where we can take that information and put it down to the point level.

So if it were there, I'll tell you I'm jealous given my business background comes in, I'm jealous of people that can do the population predictions and all that and I had done that in trading. That's what you have to do to build a business model.

And when I put the weather man hat back on, I say I wish I could do that. And maybe at some point we can, but I don't think we're there yet. So I can't advise Jamie or another client to do that at this point.

CHAIRMAN POWERS: Yes, I mean, it's just because we're probably agnosticating, say you run this early site permit out to 19 years and you say oh, I'm going to build my plant, and you dutifully build your plant and we license that for 40 years, maybe extending. So we're talking about almost a century in the future

on this. And yes.

MR. PRATER: That's a lifetime.

CHAIRMAN POWERS: Sure is.

MR. PRATER: And I think one thing that helps us on this is we're dealing, we're thinking about climate change over decades, a long term thing. So I think if we see something happening, we're going to have time to adjust to it. It's not like a thunderstorm or severe storm that's in and out in a day or an hour. So I think the scale --

CHAIRMAN POWERS: Well, my other feeling is the things that I can imagine climate affecting this particular site are not very catastrophic for a nuclear power plant. Maybe catastrophic for the farmer down the road, but maybe not so catastrophic for the nuclear power plant other than we may need it more.

Well thank you a lot. That's a probably useful perspective there to say yes, you can talk about 60 by 60 but not six by six.

MR. PRATER: That's the problem. And now in our short range weather prediction models, we're down to two kilometer scale or less. But again, it's taken 70 years to get there.

CHAIRMAN POWERS: Yes. Okay, well thank you.

MR. PRATER: Thank you.

MR. CHOWDHURY: The NRC Staff is going to present 2.3 meteorology. And Kevin Quinlan is the principal contributor, and he will introduce himself and present the slides. Kevin?

MR. QUINLAN: Good afternoon. Like Prosanta said, my name is Kevin Quinlan, I'm a meteorologist in the hydrology and meteorology branch with the Division of Site Environmental Analysis.

I have been working in this capacity with the NRC since joining in July of 2008. I graduated from Millersville University of Pennsylvania, a fellow Lancasterite with Jamie here.

CHAIRMAN POWERS: Hey. This looks like a conflict of interest.

MR. QUINLAN: Well, we're on separate sides of the city. I graduated from Millersville in 2006 with a Bachelor of Science in Meteorology and received my Master of Science degree from the University of Alabama in Huntsville in 2008 in atmospheric science.

I have been or am the lead NRC meteorological reviewer on eight combined license applications including the issued VC Summer COLA, two early site permits, and two more expected DCDs which

may be coming in in the near future.

Since March of 2013, I've also been the lead reviewer on the NRC's near term task force recommendation 2.1 reviews of the flood hazard reevaluation reports. My team leader is Ken Erwin and my Branch Chief is Christopher Cook.

They just gave a presentation on meteorology, but as they said, there are five sections related to regional climatology, local meteorology, the on-site meteorological measurements program, short term and long term atmospheric routine releases.

As the slide says, the staff held a site audit in May of 2012. And as part of that audit, we looked at the site location and the exposure of the instruments on the meteorological tower, we went out and actually did a site inspection of the tower and the areas surrounding it to make sure that it was accurate and the site was what they said it was in the SSAR.

We took a look at the quality assurance program for the data and we also analyzed the meteorological data that was submitted in support of the ESP application for the data from 2006 through 2008.

For the early site permit, PSEG chose to use a meteorological tower that's currently in use for Salem and Hope Creek as they described in their

presentation.

CHAIRMAN POWERS: You seem to be very proud of that tower.

MR. QUINLAN: It's a nice tower.

CHAIRMAN POWERS: That's what I wanted to hear.

MR. QUINLAN: As far as some of the, many of the sites that we visited, it was definitely one of the more robust programs.

MEMBER SCHULTZ: Just one of your comments, I have a question for Prosanta. And that is you just mentioned you looked at the quality assurance value there associated with the meteorology and the tower and all of that.

And I noticed in your earlier list of the audits, you did a quality assurance audit in 2011. And I was interested to know what other opportunities you had to look at quality assurance programs related to the site.

And so here's an example of one area you've examined. Have you looked at quality assurance as you've gone into the other audits that you've held?

MR. CHOWDHURY: Not specifically as a line item to do the quality assurance. But in terms of hydrology audit and also geology, seismology audit, I'm

sure the staff looked at the quality assurance program of the applicant.

MEMBER SCHULTZ: That's what I would have expected.

MR. CHOWDHURY: Yes.

MEMBER SCHULTZ: So that's good. Thank you.

MR. CHOWDHURY: And there was a recent audit that I mentioned about hydrology in 2014, February 2014 where the staff looked at the quality assurance portion in that audit also, yes.

MEMBER SCHULTZ: Thank you.

MR. QUINLAN: SER Section 2.3.1 describes the review of the regional climatology information. This section of the SER addressed the maximum tornado and hurricane wind speeds.

The site characteristic tornado wind speed of 200 miles an hour was determined through the use of Regulatory Guide 1.76 Revision 1. And because the applicant identified the most conservative tornado site characteristic by following the NRC guidance, the Staff found it to be acceptable.

The site characteristic hurricane wind speed of 159 miles an hour was determined through the use of Regulatory Guide 1.221. And again, because the

Applicant identified the most conservative hurricane site characteristic by following the NRC guidance, the Staff did find it acceptable.

This section of the SER also addressed the 50 and 100 year return period three second wind gusts. And the Staff confirmed the wind gusts through the use of Figure 6-1B of the American Society of Civil Engineers or ASE 7-05 standard. And that does follow the guidance provided to the staff and the SRP.

To determine the maximum winter precipitation roof load, the applicant followed the guidance provided in interim staff guidance document seven, interim staff guidance on the assessment of normal and extreme winter precipitation loads on the roofs of seismic category one structures.

And again, because the Applicant followed the staff guidance to determine the site characteristic, the Staff found the analysis to be correct and acceptable.

Ambient temperature and humidity site characteristics were confirmed through the use of national climatic data center records for the Wilmington and Dover, Delaware, Millville, New Jersey, and Philadelphia, Pennsylvania National Weather Service reporting stations.

The calculation of the 100 year return period temperatures used a method endorsed by the ASHRAE fundamentals handbook. And because the Applicant followed appropriate NRC guidance which was a conservative method to determine the site characteristics, the Staff found all of their values to be acceptable.

The Staff did conclude at the end of Section 2.3.1 that the identification and the consideration of the climatic site characteristics are acceptable and meet the regulatory requirements of 10 CFR 52, 100 and 100.20(c) and 100.21(d).

SER Section 2.3.2 describes the review of the local meteorology. This section of the SSAR provide detailed information showing that the PSEG meteorological data are representative of the site area. The staff used local climatological data summaries from the surrounding National Weather Service stations to confirm the local meteorological conditions presented in the SSAR.

As part of this review, the Staff did look at the on-site, of course the wind speed and direction, the wind direction persistence, as well as the atmospheric stability, temperature, humidity, different periods of precipitation, the occurrence of

fog, and the air quality and any potential influence that the plant may have on the local meteorology.

The Staff did conclude at the end of Section 2.3.2 that the Applicant's identification and consideration of the meteorological air quality and topographic characteristics of the site and the surrounding area meet all the requirements in 10 CFR Part 52.17 and 10 CFR Part 100 and are sufficient to determine the acceptability of the site.

The Staff also reviewed the availability of information related to severe local weather phenomena at the proposed PSEG site and in the surrounding area, and the Staff concluded that the Applicant had identified the most severe local phenomena at the proposed site.

Section 2.3.3 reviewed the on-site meteorological measurements program. As I stated earlier, the PSEG site chose to use the existing on-site meteorological tower that is currently supporting the Salem and Hope Creek units. The Staff --

(Simultaneous speaking)

MEMBER SKILLMAN: Kevin, let me ask you to go back a slide.

MR. QUINLAN: Sure, yes.

MEMBER SKILLMAN: How do you handle the

odd ball event? I know that there was an event at that site where there was a late season hurricane came up the bay for Louis.

Your transmission lines grew to four to six inches in diameter with ice, so they were as depressed as they could be. There was enough fog that you actually had arcing from your output mains to ground.

Doesn't happen often, but it's happened several times. So how do you handle that in consideration of local meteorology? Do you identify that as a one time event and not of concern, or do you take that into consideration in the collage of other information that you use?

MR. QUINLAN: As far as reviewing the SSAR and keeping in mind the designs of the plants in their PPE, we try to identify the most severe of each of the meteorological hazards. And then at the COL stage, we would compare it against the actual design of the site for the category 1 structures.

I don't believe the transmission lines fall under, I'm not sure that they fall under that category. So that's really where our concern lies when doing the meteorological reviews is how does it compare to the site parameters at the site?

At the early site permit stage, because

they're using a PPE and there is some variance in the site parameters between all the four different designs, we're really just trying to identify the most severe of the meteorological hazards. For fog, it's the occurrence of fog. That's really what the National Weather Service local climatic data summaries provide us.

MR. MALLON: Well, the icing event would go to loads on CAT 1 structure roofs, right?

MR. QUINLAN: Yes. We have the snow load ISG will provide for the weight of the snow, ice, and the rain on snow.

MR. MALLON: Right. Which for us was, I'm looking for the number. I thought we had it here.

MEMBER SKILLMAN: Yes, I saw it, 22 pounds for --

(Simultaneous speaking)

MR. MALLON: Yes.

MEMBER SKILLMAN: Yes, I see your chart of snow load versus snow depth and a couple charts showing that, yes. I was thinking more about the impact on the operators when you had actually your transmission lines sparking to the ground. And that was an ice and fog event.

And I understand what you're saying. Hey,

we're really concerned in the PPE envelope how that fits to the basic designs that we're considering. But I was just kind of amusing how serious that particular event was.

MR. MALLON: Sure.

MEMBER SKILLMAN: Thank you.

MR. QUINLAN: The Staff, let's see where we're at. The Staff completed the quality assurance review of the on-site meteorological data submitted by PSEG as part of the early site permit application. This review included quality assurance of all measured meteorological variables, the location and the exposure of the instruments, and the routine instrument maintenance procedures.

The Staff concluded that the PSEG meteorological tower conformed to Regulatory Guide 1.23 criteria for siting of the tower in relation to the proposed PSEG and the existing Salem and Hope Creek sites, and the Staff determined the Applicant had adequately provided all relevant information in SSAR section 2.3.3.

The Staff conclude that the on-site program provided adequate data to represent on-site meteorological conditions as required by 10 CFR Part 100.

SER Section 2.3.4 describes the review of the short term atmospheric dispersion estimates or chi over Q values that are used to evaluate design basis accidental releases to the exclusion area boundary and to the outer boundary of the low population zone.

The Staff independently developed a joint frequency distribution, or JFD, from the on-site meteorological data to be used as part of the input files to the PAVAN computer model.

All PSEG site characteristic values presented in the SSAR section have been found to be acceptable for both the EAB and the LPZ. And using the NRC approved computer models, the Applicant has provided this information, and the Staff confirmed it as correct and adequate. And the Staff did conclude that the site characteristics and design parameters are acceptable to meet the requirements of 10 CFR Part 52 and Part 100.

MEMBER SCHULTZ: So the confirmatory calculations you did matched to or provided a confidence of the calculations that were performed by the Applicant?

MR. QUINLAN: Yes. I took the on-site meteorological data, the three years that they submitted, created my own joint frequency

distribution, and then ran the PAVAN model to confirm their values.

MEMBER SCHULTZ: Good, thank you.

MR. QUINLAN: Yes. SER Section 2.3.5 describes the review of long term atmospheric dispersion estimates that are used to evaluate releases of radiological effluence to the atmosphere during normal plant operation.

Again, the Staff generated a joint frequency distribution for use in the XOQ DOQ computer program to determine the chi over Q and D over Q values for all receptors of interest. The Staff confirmed that the Applicant's long term atmospheric dispersion estimates are correct and adequate.

The staff identified COL action item 2.3-1 as provided, the text is on the slide. This COL action item ensures that if any different exposure pathways and dose receptor locations, including those in sectors adjacent to the Delaware River are identified, then they'll be considered at the time of the COL submittal.

The Applicant provided meteorological data and did atmospheric dispersion model that is appropriate for the characteristics of the PSEG site and their release points. The Staff review confirmed that the Applicant addressed the required information

related to long term diffusion estimates, and there's no outstanding information to be addressed in the SSAR related to this review.

Using NRC approved computer models and methodologies, the Applicants provided this information, and the Staff has accepted it as correct and adequate.

The NRC Staff concludes that the data provided for atmospheric disbursement and deposition conditions meet the requirements in 10 CFR Part 100 and are appropriate for an evaluation to demonstrate compliance with the numerical guides for doses for any individual located off site contained in 10 CFR Part 50 Appendix I.

In conclusion, all PSEG site characteristics presented in SSAR Section 2.3 Meteorology have been found to be acceptable. Section 2.3 of the PSEG SSAR have been reviewed by the Staff and have been found to adhere to all regulatory requirements. SAR Section 2.3 has been submitted with no open items, exceptions, or departures. Thank you.

CHAIRMAN POWERS: Are there any questions on this? Well, thank you very much.

MR. QUINLAN: Thank you.

MR. CHOWDHURY: I would like to go back to

Dr. Schultz question earlier to which Rao provided some response. Are you satisfied with the response, or you want us to come back with more detail in terms of how future hazards may be addressed?

MEMBER SCHULTZ: I feel comfortable with the response that Rao presented.

CHAIRMAN POWERS: Well, I think it's a continuing question. It's not the easiest to answer, but it's one that the ACRS as a whole needs to have a better understanding of. It has nothing to do with this particular application.

MEMBER SCHULTZ: That's right.

CHAIRMAN POWERS: It's an area of issue that we need to bear in mind.

MEMBER SKILLMAN: Yes, I would like to go back and take a look, and I'll do this myself, at Part 52. I thought that there was a hook in Part 52 where the co-applicant had to keep the data current. What was presented suggested that once the ESP is granted, then there is no further continuing accountability under regulation to keep the data up to date.

CHAIRMAN POWERS: Well, I think there is.

MEMBER SKILLMAN: I think there is, too.

CHAIRMAN POWERS: But I think that has to do with the COL --

MEMBER SKILLMAN: I do, too.

CHAIRMAN POWERS: -- requirements.

MEMBER SKILLMAN: I think it's in Part 52.

CHAIRMAN POWERS: Well, I think it references back to 50 on that.

MEMBER SKILLMAN: And it could be. But I believe there is a regulation that requires maintenance of continuity or accuracy as license proceeds.

CHAIRMAN POWERS: I mean, the more germane issue is the hazard that arises --

MEMBER SKILLMAN: In the future.

CHAIRMAN POWERS: In the future has nothing to do with either the COL or the --

MEMBER SKILLMAN: ESP.

CHAIRMAN POWERS: -- ESP, but it's something that was unanticipated. What do we do here in that case? And I mean, that may be an issue that where we need guidance from five great Americans on that.

MEMBER SKILLMAN: Yes, yes.

MEMBER BLEY: Rao also pointed out that somewhere in the regulations, I don't know where it is, there's a requirement if the licensee becomes aware of it --

CHAIRMAN POWERS: Well, that means

explicitly required. That's clear. That's --

(Simultaneous speaking)

CHAIRMAN POWERS: That has nothing to do with you guys.

MR. MALLON: I know that hook is set, yes.

CHAIRMAN POWERS: Yes, I mean, that's something for us to worry about, not for you guys to worry about.

MEMBER SKILLMAN: And I know what Rao communicated is also accurate, and that is if identity wanted to put out a chlorine processing plant or some kind of large petro plant nearby, the State permitting requirements would force that applicant to consider the impact on other industrial facilities --

CHAIRMAN POWERS: Oh yes, absolutely.

MEMBER SKILLMAN: -- including local nukes.

MEMBER BLEY: That varies state by state, however.

MEMBER SKILLMAN: Yes.

MEMBER BLEY: The extent of those requirements. Some are real stringent, New Jersey especially.

MEMBER SKILLMAN: Yes, and others not so.

MEMBER BLEY: Others not nearly so much as

that.

MEMBER SKILLMAN: So I don't think that there's a huge gap, but I think there is an item of consideration here.

MR. CHOWDHURY: The one thing I wanted to mention here from my past experience is that in terms of impact of other industries on a plant, state and particularly local government organizations emergency plan, they have been trained in corporate dose in that all hazard emergency plan to provide adequate response and come into agreement with the nuclear power plants to provide adequate response to those events that have nothing to do with the nuclear power plant event, yet impacting the nuclear power plants.

So a case in point is the State of Louisiana, where there's a huge number of chemical plants. And I happen to be involved in that emergency planning process on behalf of the State Government there for a number of years.

And they do seriously include all those components of chemical accidents on the control room habitability and the on-site people, including those who would be providing response to those events from our site.

MEMBER SCHULTZ: You bring up a good point

because it's very frequent that we hear about local communities or states looking at citing other hazardous facilities and coming up with their communications to the public to say we know how to handle this hazard because we have nuclear power plants that are within our jurisdiction.

And based on what we've learned from emergency planning around the nuclear power plants, we can handle the hazard that is proposed by this facility. And so that discussion usually does happen, certainly.

MR. CHOWDHURY: There is another component to it is the communication between the U.S. Nuclear Regulatory Commission and the Early Emergency Management Agency. Very close communication in terms of what's happening versus changing and how it's impacting and how they would evaluate that integrated response to the event.

MEMBER SCHULTZ: We're still trying to look for something that we could point to to say and this is how it's caused to happen. But I think we all do know that it does happen, but it would be nice to be able to point to a regulation or a --

(Simultaneous speaking)

CHAIRMAN POWERS: At this point, I think we can open up the bridge line and ask if there are any

comments from people on the bridge line. And of course, I have no idea whether the bridge line is open now or not.

MEMBER BALLINGER: I have a question because I'm an ignorant metallurgist. We've got Salem and Hope Creek.

To what extent could you take advantage of what's been done for Salem and Hope Creek? I mean, I'm pretty sure he didn't have to go back and get 100 years worth of weather from scratch.

MR. MALLON: No, I think it was the, you know, they set up the met tower probably, I don't know what they have for a construction permit. For an operating license I believe you had to have three years, maybe two.

MEMBER BALLINGER: But they licensed Salem and Hope Creek. So somewhere along the line, they had to get the same level of detail, and it hasn't been that long. So to what extent can you take advantage of what was done for Salem and Hope Creek as part of this process?

MR. MALLON: Three years.

MEMBER BALLINGER: I mean, you have to invent everything all over again, right?

MR. MALLON: Yes, we kind of chose to.

MEMBER BALLINGER: You did.

MR. MALLON: Right, we actually, we made a conscious decision to give an entirely new set of information. Now, we went backwards, and tomorrow we'll talk a little bit about the geology. So we did our own geological exploration. Some of the other ESPs didn't.

Now we did then go back and make sure that what we found was consistent so that we didn't see anything anomalous, but we said no, we're going to gather brand new data.

And that actually, as an aside, helped us in Fukushima response because then when we had to do for Salem and Hope Creek new seismic analysis, I had brand new boring data on site that I could give to our experts and they could use that to lessen the uncertainties they assumed. So it actually helped us.

CHAIRMAN POWERS: Yes, I would think you would just be forced to do that because the regulatory requirements have changed so much.

MEMBER SKILLMAN: Yes, Salem and Hope Creek were Part 50 licenses. This is a Part 52, so this is a new approach under Part 52.

MEMBER BALLINGER: Oh, I understand that part. But the same basic data had to be gathered.

CHAIRMAN POWERS: Let me go back to our on line participants and ask if there are any comments to be made. Hearing none, I'm going to recess this meeting until tomorrow morning at 8:30.

Thank you very much, the presentations were suburb and I really liked the one to one comparisons. So that, I think that really helps us understand what's going on. So we're recessed until 8:30 tomorrow morning.

(Whereupon, the meeting in the above-entitled matter was concluded at 3:58.)

1

PSEG Early Site Permit
Advisory Committee on Reactor Safeguards Subcommittee Meeting
SSAR Section 2.1/2.2

September 29, 2014

PSEG Power LLC

Early Site Permit – Overview

Jamie Mallon
ESP Manager

PSEG Power LLC

Early Site Permit Application

PSEG Power LLC and PSEG Nuclear LLC are applicants

Reactor technology has not been selected

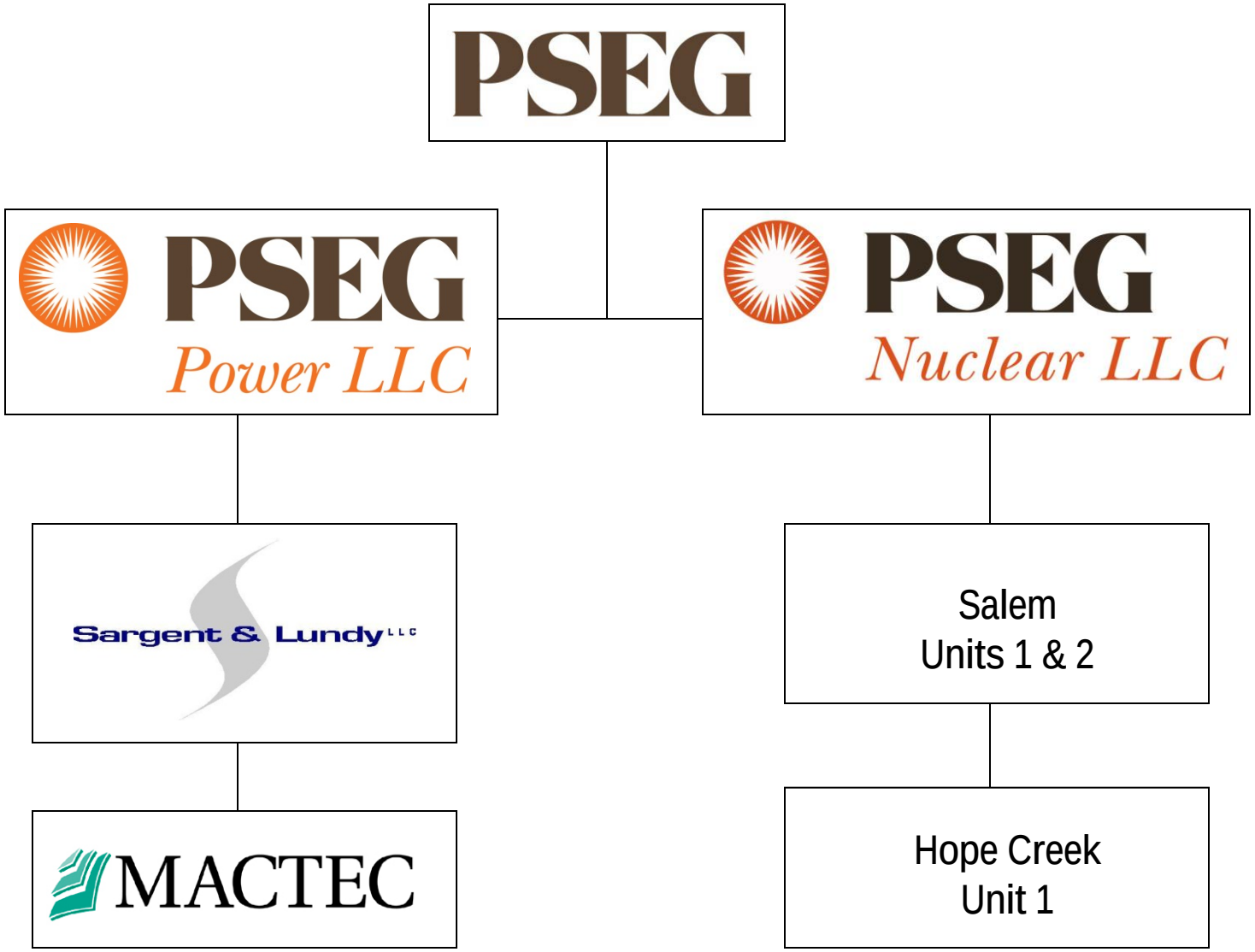
Application includes:

- Site Safety Analysis Report to address impacts of the environment on the plant, including hurricanes and earthquakes
- Emergency Plan – consistent with existing plants
- Environmental Report

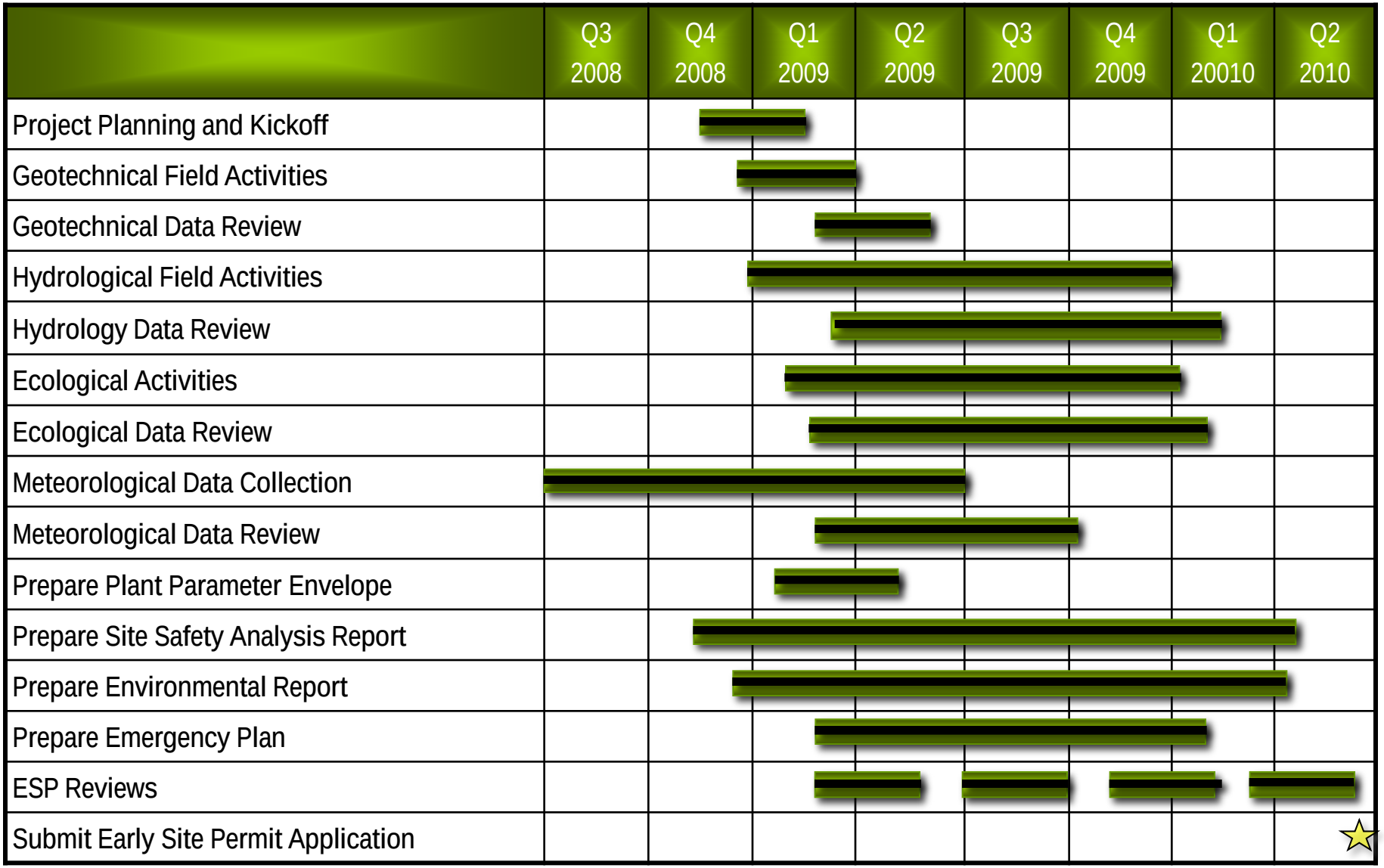
ESPA based on a "plant parameter envelope" (PPE)

- Assumes single large unit or two smaller units
- Impacts address footprints and other parameters such as water use
- Up to 2200 MWe for the two unit plant [Westinghouse AP-1000]

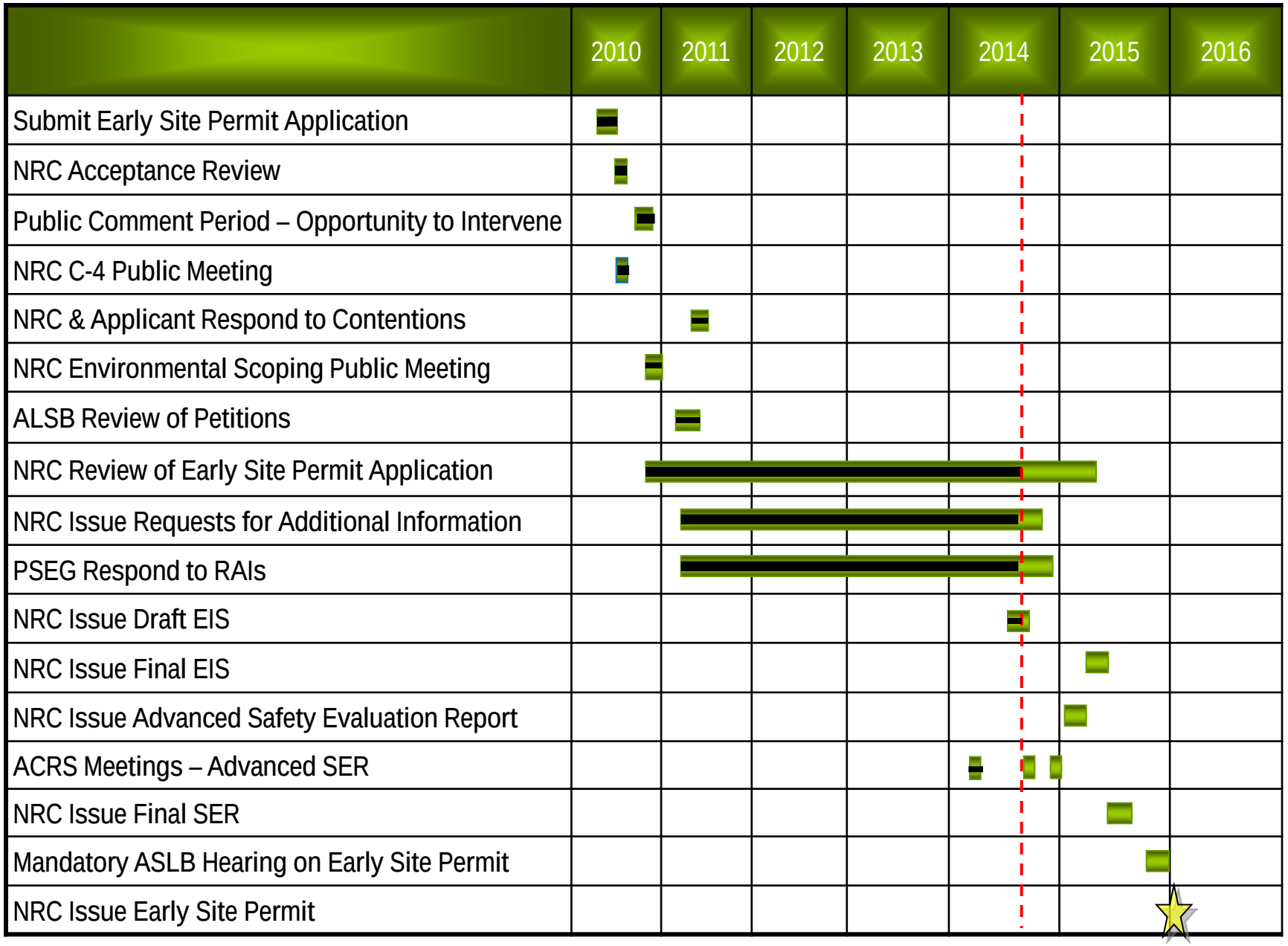
PSEG Early Site Permit Organization



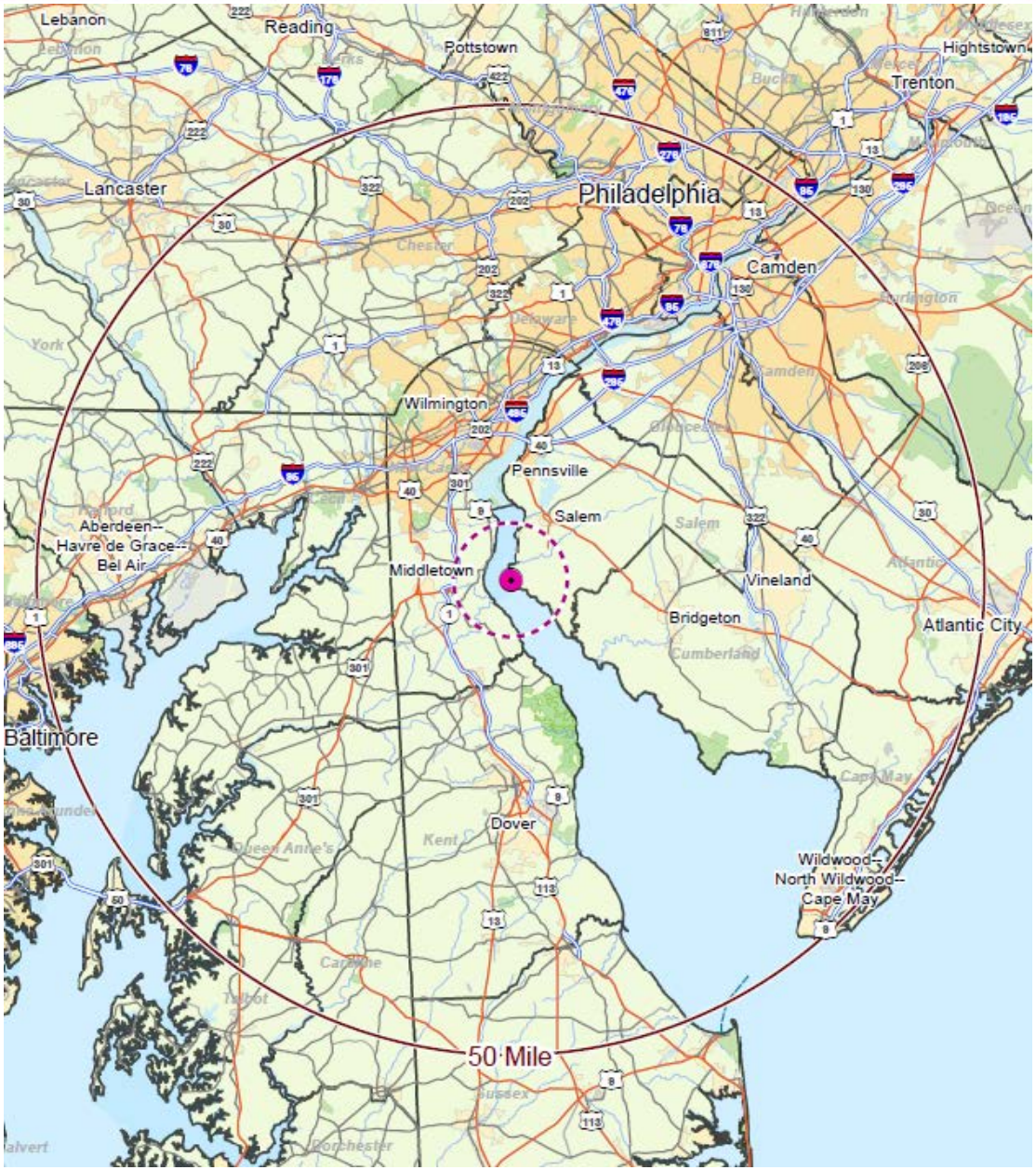
Early Site Permit Application – Submitted May 25th 2010



ESP Project Update - Licensing Process

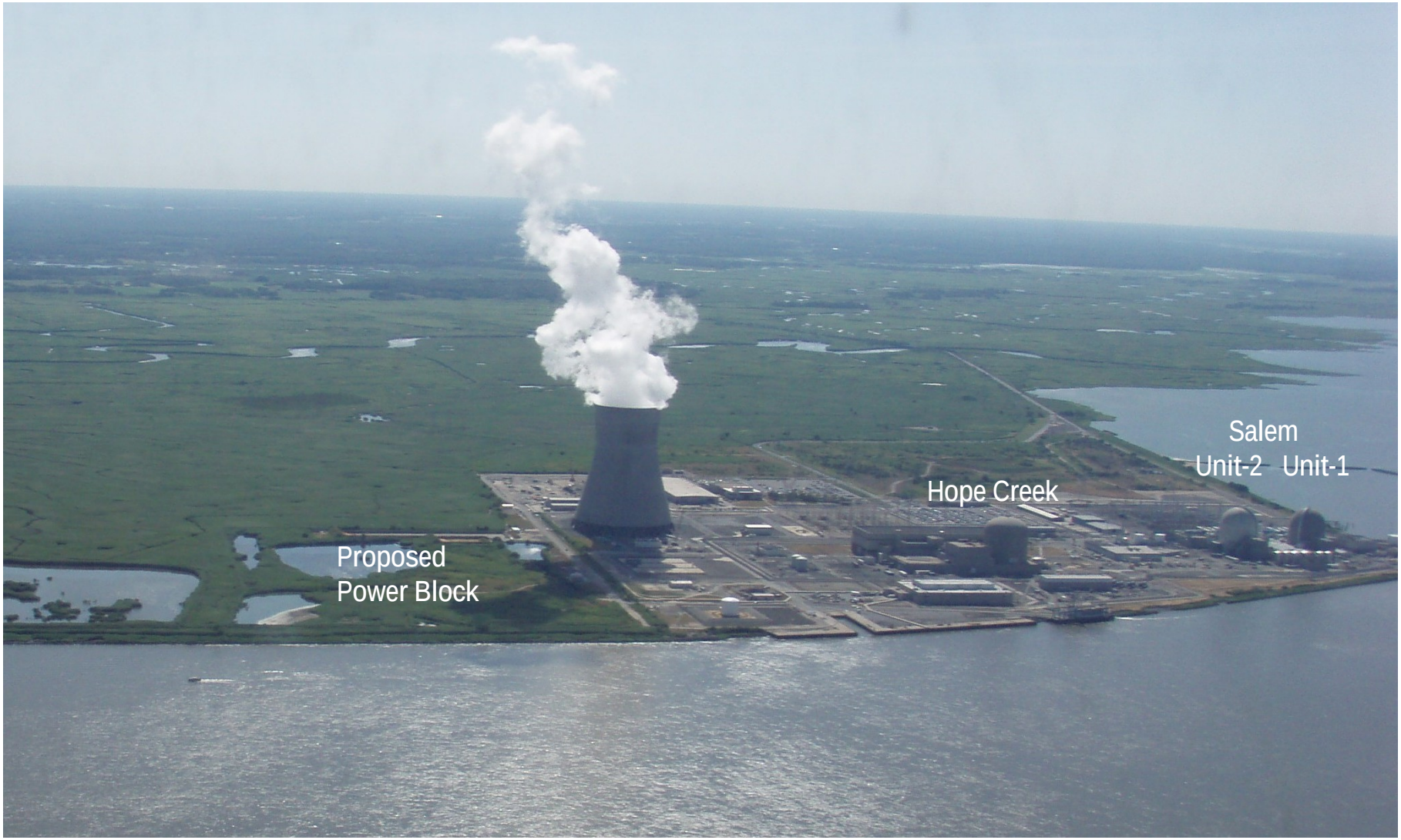


PSEG ESP Site and Regional Vicinity (NJ, DE, PA and MD)



PSEG Power LLC

Salem and Hope Creek Nuclear Generating Stations & Proposed Site



PSEG Power LLC

ESP Application Development

Regulatory guidance to prepare the application

- 10 CFR Part 52 – Subpart A
- RG 1.206 - Combined License Applications for Nuclear Power Plants (LWR Edition)
- NUREG – 0800 - Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition
- RS-002 – Processing Applications for Early Site Permits

Studies and processes

- Site Studies and Investigation Programs
- Conceptual Design and Analysis
- Plant Parameter Envelope

Plant Parameter Envelope Development

Follow the Part 52 process as designed

Reactor technology designs not yet mature

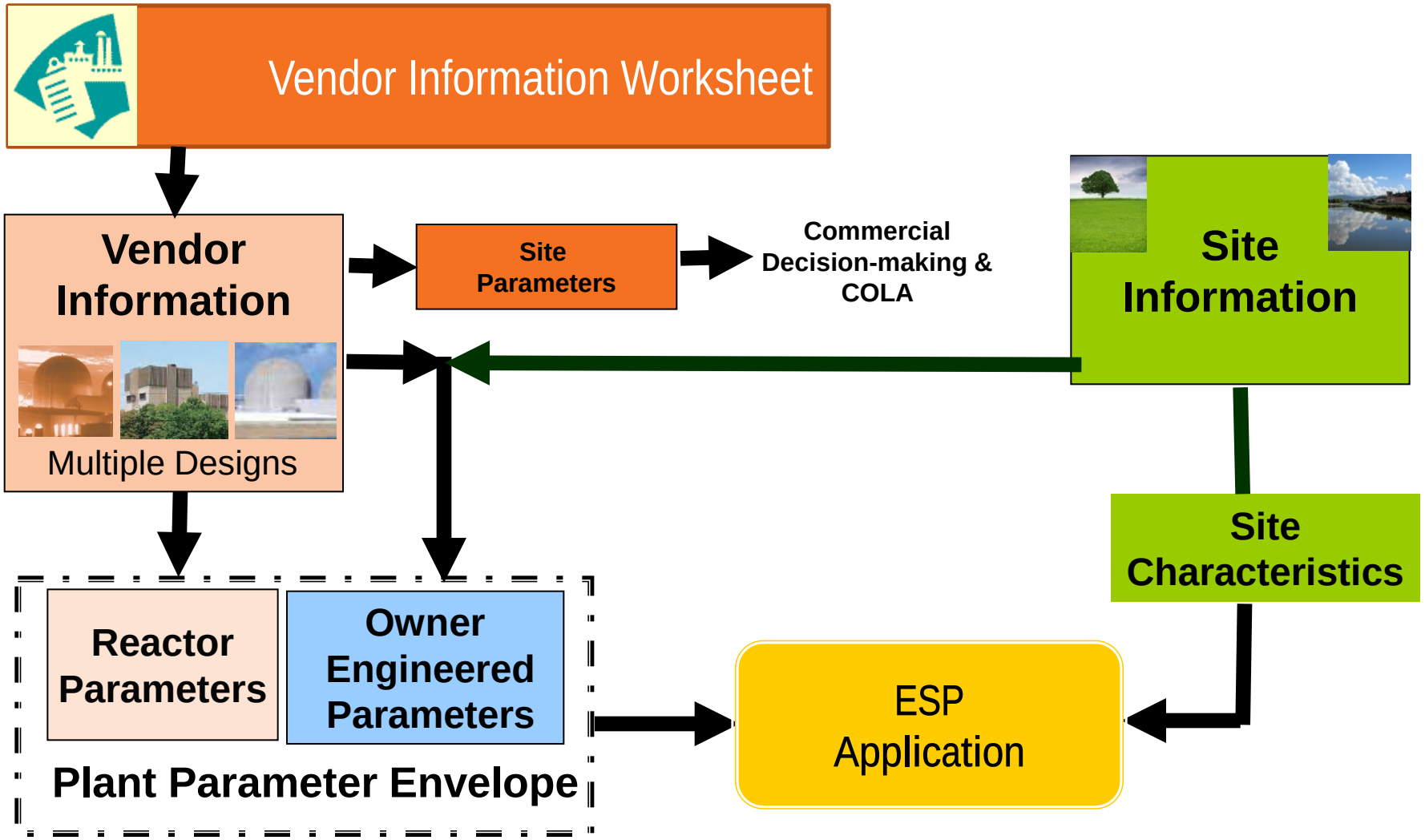
- Regulatory risk exists until Design Certification reviews are complete
- Technology and commercial risks exist until detailed designs are more complete

Bounding values for parameters that define facility's interaction with the environment

Reactor technology designs considered:

- Single Unit ABWR
- Single Unit U.S. EPR
- Single Unit US-APWR
- Dual Unit AP1000

Plant Parameter Development Approach



Chapter 2 – Section 2.1
Geography and Demography

PSEG Power LLC

Section 2.1 – Geography and Demography

Section 2.1 – Geography and Demography

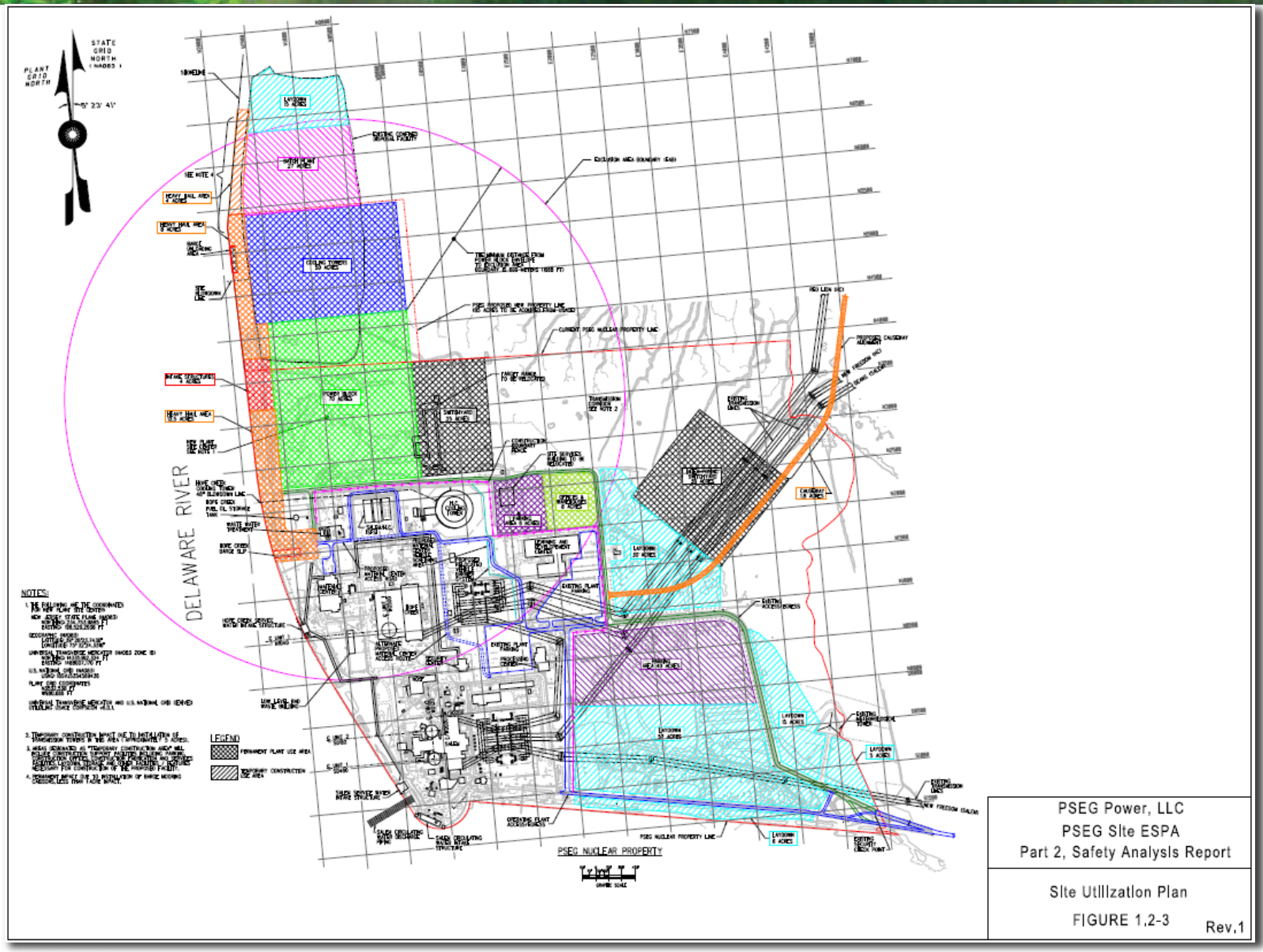
Site Location and Description

- Power Block Area bounds the location of power block structures for all reactor designs under consideration
- Coordinates provided for Power Block Area center point, based on the centroid of reactor containment locations for all reactor designs under consideration
- Exclusion Area Boundary is a circle at least 600 meters from the edge of the Power Block Area in all directions
- Exclusion Area Boundary encompasses part of Delaware River, but no public roads, railroads, or structures other than PSEG power plant structures

Exclusion Area Authority and Control

- All land within the Exclusion Area is owned and controlled by either PSEG or the federal government / U.S. Army Corps of Engineers
- PSEG will obtain legal authority from the Corps, assuring that activities on Corps land within the Exclusion Area can be controlled

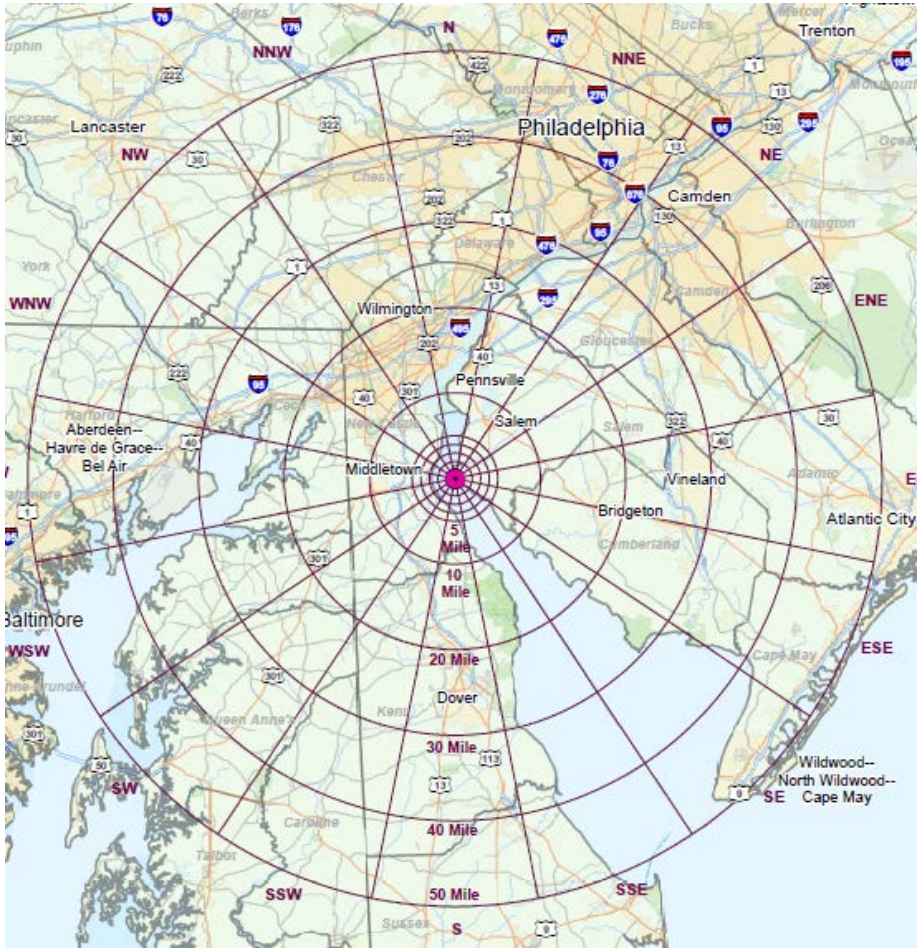
Section 2.1 – Geography and Demography



Section 2.1 – Geography and Demography

Population Distribution

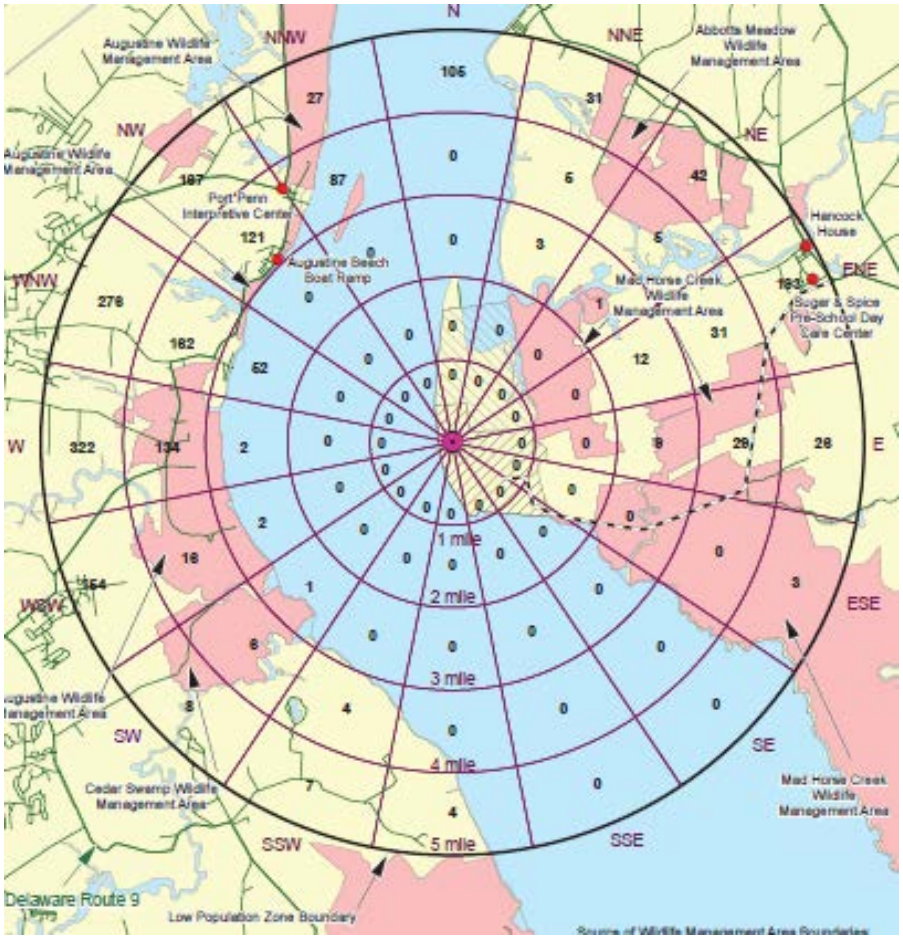
- Resident and transient population within 50 miles estimated using most recent available Census data
- Future population projected in 10-year increments from 2021 (first year of plant operation) to 2081 (last year of plant operation)
- Projected for each distance and radius from PSEG Site



Section 2.1 – Geography and Demography

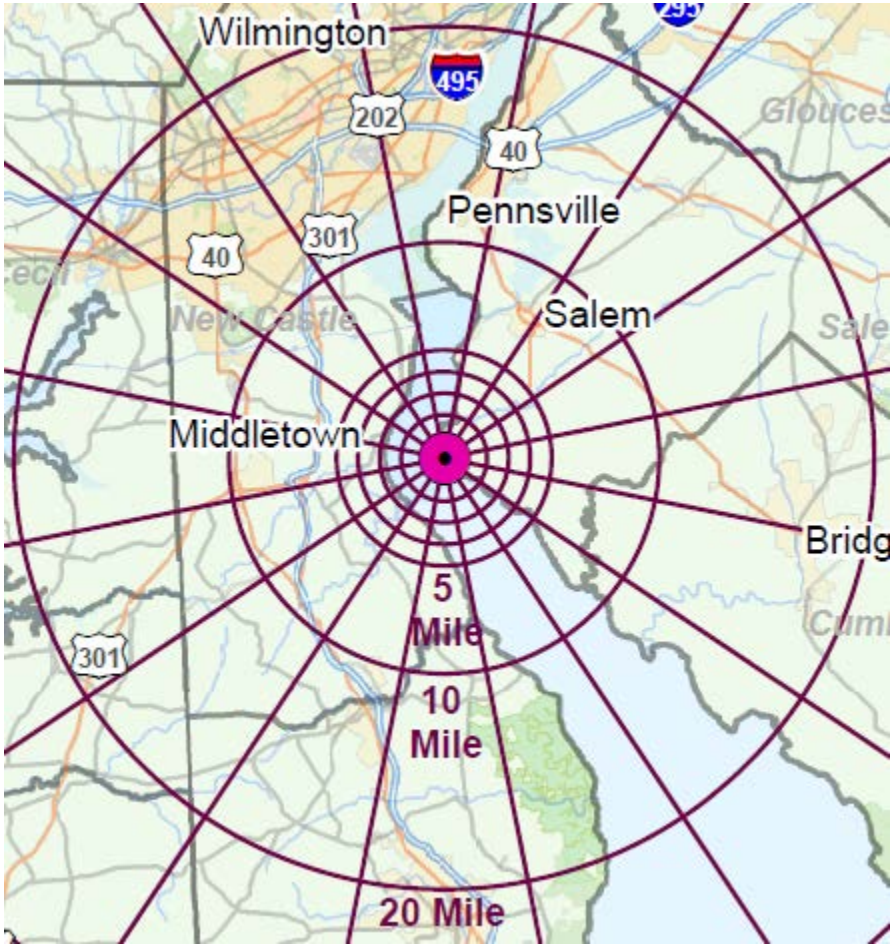
Population Distribution

- Low Population Zone is a 5-mile radius around the Power Block Area center point
  - Includes open water, coastal marshes, and land controlled by PSEG, U.S. Army Corps of Engineers, or New Jersey Department of Environmental Protection



Population Distribution

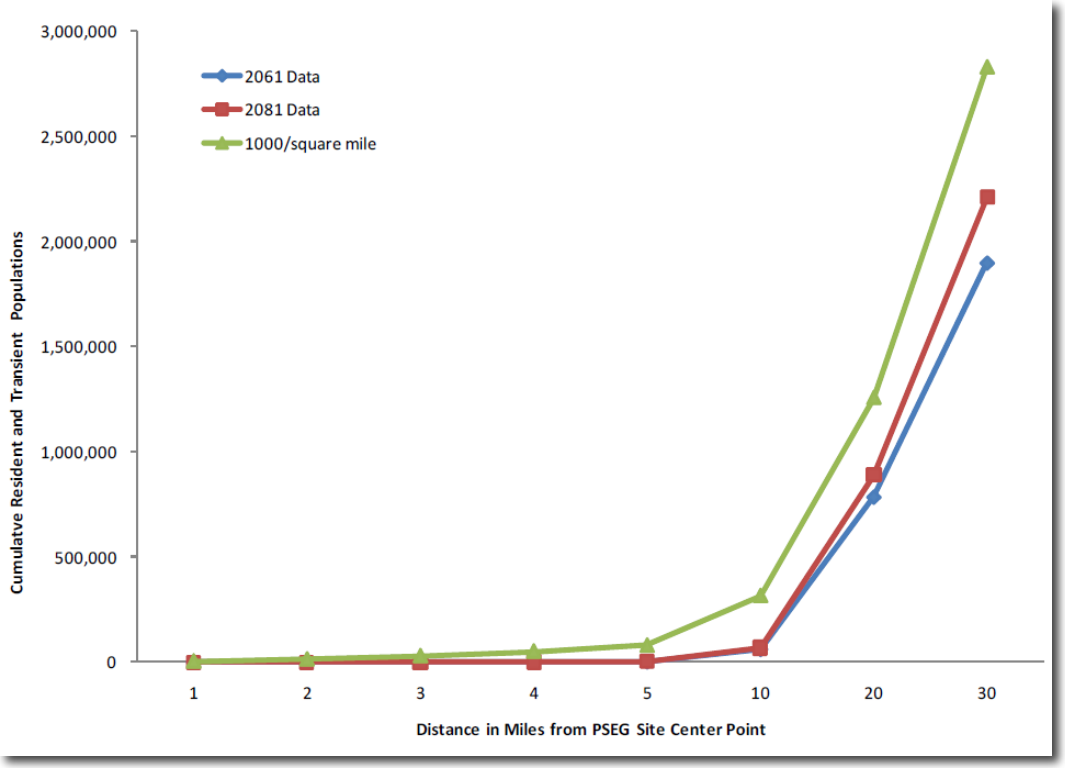
- Distance to population center boundary (greater than about 25,000 residents) complies with 10 CFR 100.21 guidance
  - Nearest current population center is Wilmington, DE, 14.8 miles north
  - Nearest future population center is Middletown, DE, 7.0 miles west



Section 2.1 – Geography and Demography

Population Distribution

- Current and future population density complies with regulatory guidance
  - Resident population density within 30 miles complies with RG 1.70
  - Resident and weighted transient population density within 20 miles complies with RG 4.7 and NUREG-0800



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Section 2.1 – Geography and Demography

- Exclusion Area Boundary encompasses part of Delaware River, but no public roads, railroads, or structures other than PSEG power plant structures
- All land within the Exclusion Area is owned and controlled by either PSEG or the federal government / U.S. Army Corps of Engineers
- Resident and weighted transient population is low currently and over the projected life of the plant

Chapter 2 – Section 2.2
Identification of Potential Hazards in Site Vicinity

PSEG Power LLC

Section 2.2 – Nearby Industrial, Transportation, and Military Facilities

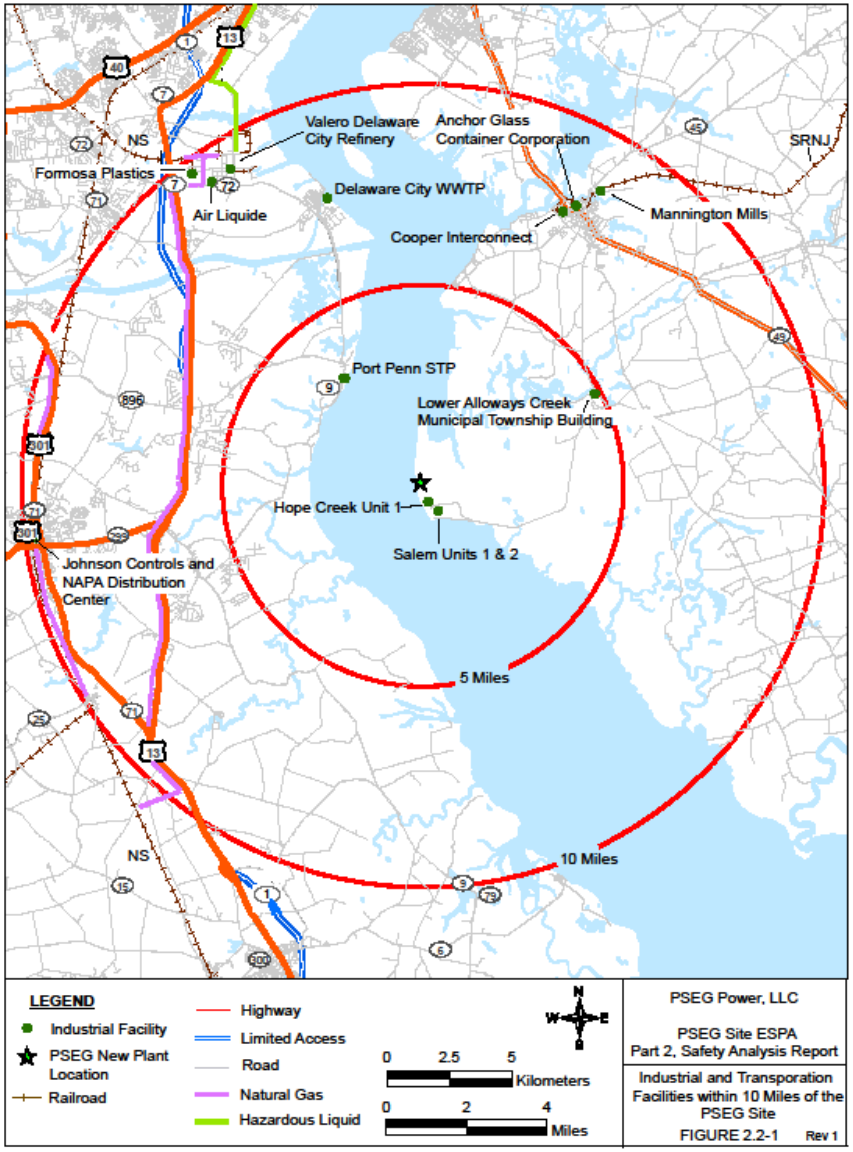
Locations and Routes

- Industrial, transportation, and military facilities and activities in the PSEG Site area identified in accordance with RG 1.206
  - Identified all facilities and activities within 5 miles
  - Identified potentially significant facilities and activities beyond 5 miles
- 4 industrial facilities, 3 public roads, 2 waterways, 2 airways, 1 jet route, and 1 helipad identified within 5 miles
- Additional industrial facilities, public roads, waterways, airways, jet routes, and airports, plus 2 pipelines, identified between 5 and 10 miles
- No military facilities identified within 10 miles

Description of Hazards

- Identified chemicals used, produced, or transported by each facility/activity
  - Salem and Hope Creek Generating Stations most significant chemical use
  - Delaware River most significant transportation route
- No plans identified for new or expanded industrial, transportation, or military facilities within 5 miles

Section 2.2 – Nearby Industrial, Transportation, and Military Facilities



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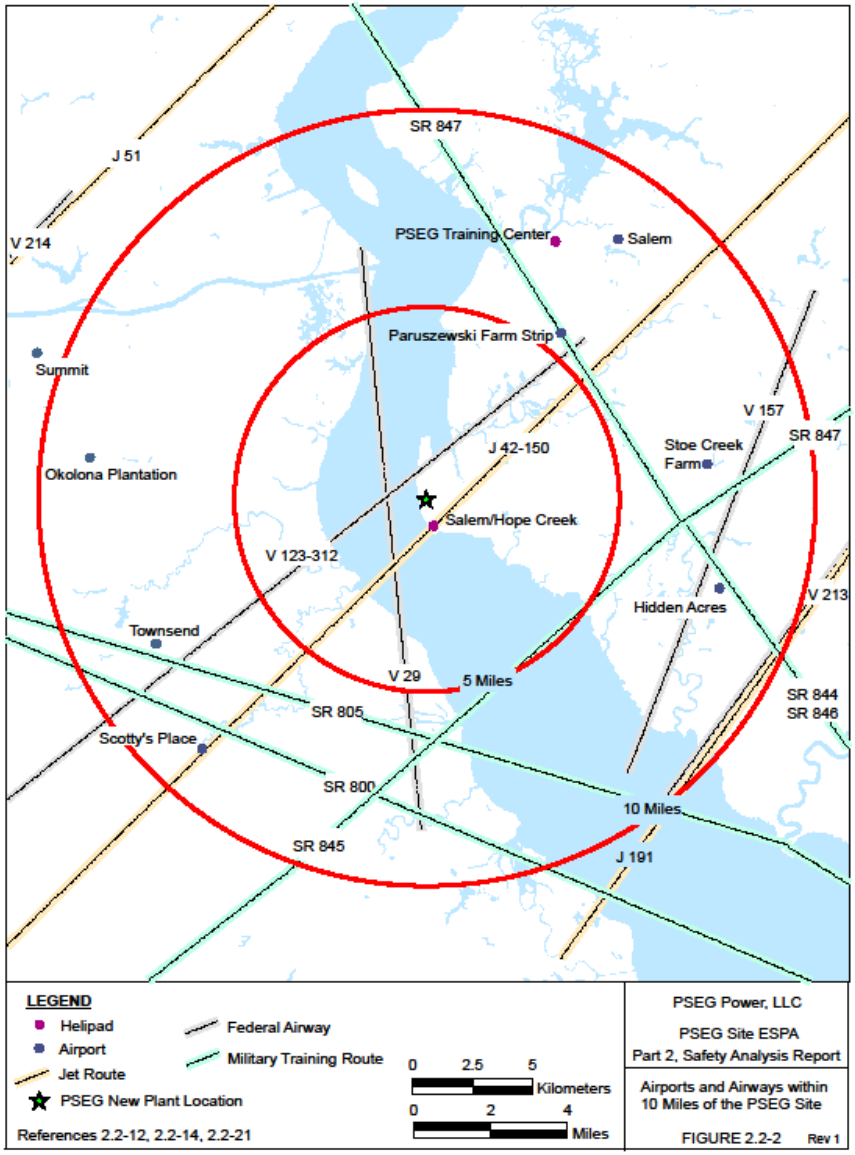
Section 2.2 – Nearby Industrial, Transportation, and Military Facilities



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Hazard Categories

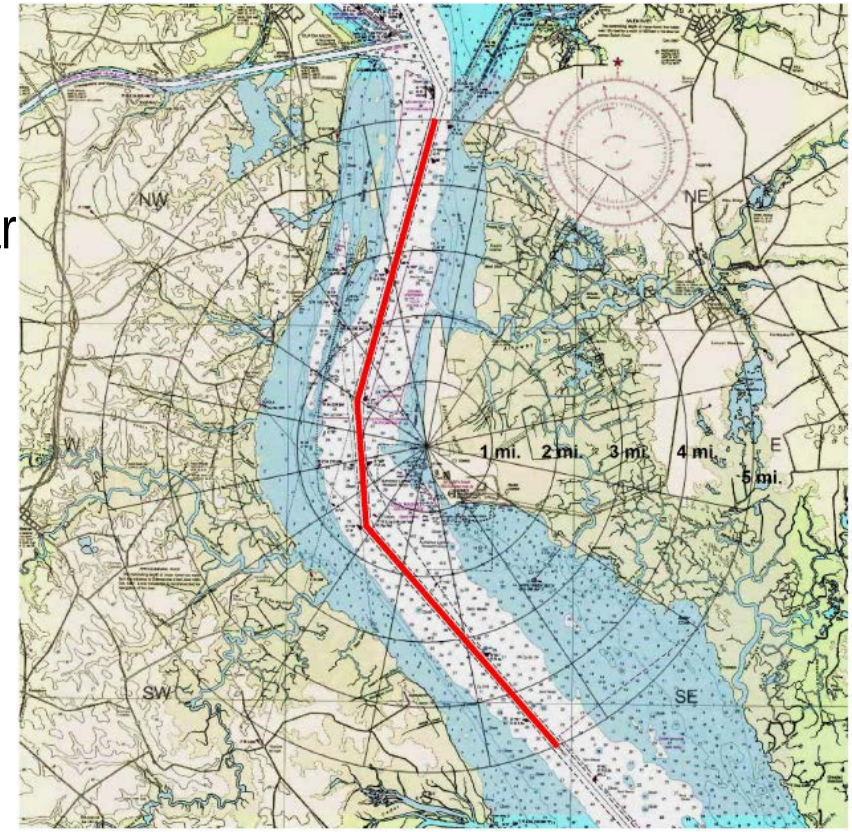
- Chemical Releases – Explosion, flammable vapor cloud, toxicity hazard, or fire
- Collisions with cooling water intake structure
- Liquid spills that could be drawn into the cooling water intake structure
- Radiological hazards

Effects of Chemical Releases

- No Rail or Highways in Vicinity
- Few Nearby Facilities: Very Isolated
- Adjacent Site Chemicals: Standoff distances determined
  - 6000 gal gasoline tank / gasoline delivery route to be moved
- Onsite Chemical Analysis when reactor technology selected
- Toxicity Analysis when reactor technology selected
- Primary source of hazards to the new plant is chemical shipments on the Delaware River

Delaware River – Vessel Traffic Analysis

- Entrance to Port of Philadelphia
  - Several thousand shipments/year
- Approach 1 mile from new site
- Anchorages
- Data gathered from Army Corps of Engineers, Coast Guard, and Maritime Exchange
  - Types of shipments, mass in vessel, number of shipments
  - Total number of trips determined



Probabilistic Analysis

- For each combination of parameters, the frequency of a hazard:

  $R_{haz} = P_{spill}\ R_{acc}\ P_{wea}\ D_{trip}$

- The total allowable trips:

  $T_{allow} = 10^{-6} / \Sigma R_{haz}$

- For the example, T_{allow} = 397 & the actual number of trips is 129

Standoff Distance (Miles) vs. Stability Class and Spill Size for Propane

	<2,000 gallons	<10,000 gallons	<50,000 gallons	<322,000 gallons	>322,000 gallons
Class G	<0.9	1.8	3.4	5.0	5.0
Class F	<0.9	1.1	2.0	4.3	5.0
Class E	<0.9	<0.9	1.2	2.5	5.0
Class D	<0.9	<0.9	<0.9	1.7	5.0
Class C	<0.9	<0.9	<0.9	<0.9	5.0

Total probability of explosive hazard from flammable vapor clouds due to all chemicals and solid explosives greater than 10^{-6}; considering highest CCDP, 7.35×10^{-9}

Collision with Intake Structure

- River traffic from 2003-2007 USACE data
- Non-self propelled vessel accident data from NUREG/CR-6624
- Probability of collision is much smaller than the 10^{-7} per year threshold for a design basis event

Liquid Spills

- Spill will be diluted by the large quantity of Delaware River water
- No impact to new plant based on intake structure design features

Radiological Hazards

- Release of radioactive material from either HCGS or SGS would not threaten the safety of the new plant due to radiation monitors on control room ventilation system

PSEG Early Site Permit
Advisory Committee on Reactor Safeguards Subcommittee Meeting
SSAR Section 2.3

September 29, 2014

PSEG Power LLC

Chapter 2 – Section 2.3
Meteorology

PSEG Power LLC

Subsection 2.3.1 – Regional Climatology

Data Sources

- Hourly wind, precipitation, temperature and humidity
  - FAA, NWS, military
- Daily max/min temperature and precipitation
  - Cooperative observers (“COOPs”)
- Published data summaries and guidance
  - NCDC reports
  - ASHRAE
  - ASCE
- NRC guidance
  - Tornado and hurricane winds
  - Winter precipitation (ISG DC/COL-ISG-07)

Subsection 2.3.1 – Regional Climatology

PSEG Site Characteristic Values (SSAR Table 2.0-1)

- Record Temperatures
  - 0% exceedance (record high) DBT highest observed regional record (108° F from Marcus Hook, PA COOP station).
  - MCWB coincident with 0% DBT (79° F) estimated from Wilmington, DE DBT/wet-bulb depression table
  - 100% exceedance (record low) (-15° F) lowest observed regional record (Millington 1 SE MD)
- 100-yr maximum and minimum dry-bulb temperatures
  - ASHRAE (2009) technique
  - Regional stations with relatively long digital records [Dover (61 yrs), Millville (35 yrs), Wilmington (39 yrs)]
  - 105.9° F (Dover)
  - -18.7° F (Wilmington)

Subsection 2.3.1 – Regional Climatology

PSEG Site Characteristic Values (Table 2.0-1)

- UHS Ambient Air Temperature and Humidity
  - Highest 1-day, 5-day and 30-day running average WBT and coincident DBT from hourly data
  - Hourly data from Dover (61 yrs), Millville (35 yrs), Wilmington (39 yrs)
    - 1-day values: 82.69° F WBT / 87.12° F DBT
    - 5-day values: 78.02° F WBT/ 83.47° F DBT
    - 30-day values: 75.87° F WBT / 82.65° F DBT
- Basic wind speed
  - 117.7 mph from ASCE guidance
- Hurricane wind speed
  - 159 mph extracted from RG 1.221
- Tornado characteristics
  - RG 1.76, Rev 1 Tornado intensity region II (200 mph)

Subsection 2.3.1 – Regional Climatology

PSEG Site Characteristic Values (Table 2.0-1)

- Winter precipitation
  - 100-yr ground-level snowpack (24 lb/ft^2) from ASCE Standard 7-05
  - 48-hr PMP (21 in.) from *NOAA Hydromet. Report #53*
  - Extreme winter frozen precipitation (20.51 lb/ft^2) per ISG DC/COL-ISG-07
  - Normal winter precipitation (24 lb/ft^2) per ISG DC/COL-ISG-07

Subsection 2.3.2 – Local Meteorology

Meteorological Conditions at PSEG Site

- Data sources
  - Primary on-site 300-ft tower at S/HC (Section 2.3.3)
    - Data from 1977-2008 (32 years) and 2006-2008 (3 years)
  - Regional weather stations (Section 2.3.1)

- Historical on-site dry-bulb temperature, wind precipitation data consistent with observations from regional stations (Subsection 2.3.2.2)

- Compares frequency of Pasquill stability class from on-site tower for 3-year period with frequency for 32-year period
  - 33 ft. – 150 ft. delta-T
  - 3-year and 32-year periods show similar distributions (Table 2.3-26)

Subsection 2.3.3 – On-site Meteorological Measurements

Use Current Primary and Backup Towers to Support New Plant

- Primary tower
  - In operation for more than 30 years
  - 300-ft. guyed lattice design
  - Located 5,470 ft. southeast of new plant power block area
  - Instrumented at 300, 197, 150 and 33 ft. levels
  - Instrumentation described in Table 2.3-28
  - Instrumentation meets RG 1.23 Rev. 1

- Back-up tower
  - 10-meter (33-ft.) utility pole
  - 386 ft. south of the primary tower
  - Instrumentation described in Table 2.3-28

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Subsection 2.3.3 – On-site Meteorological Measurements

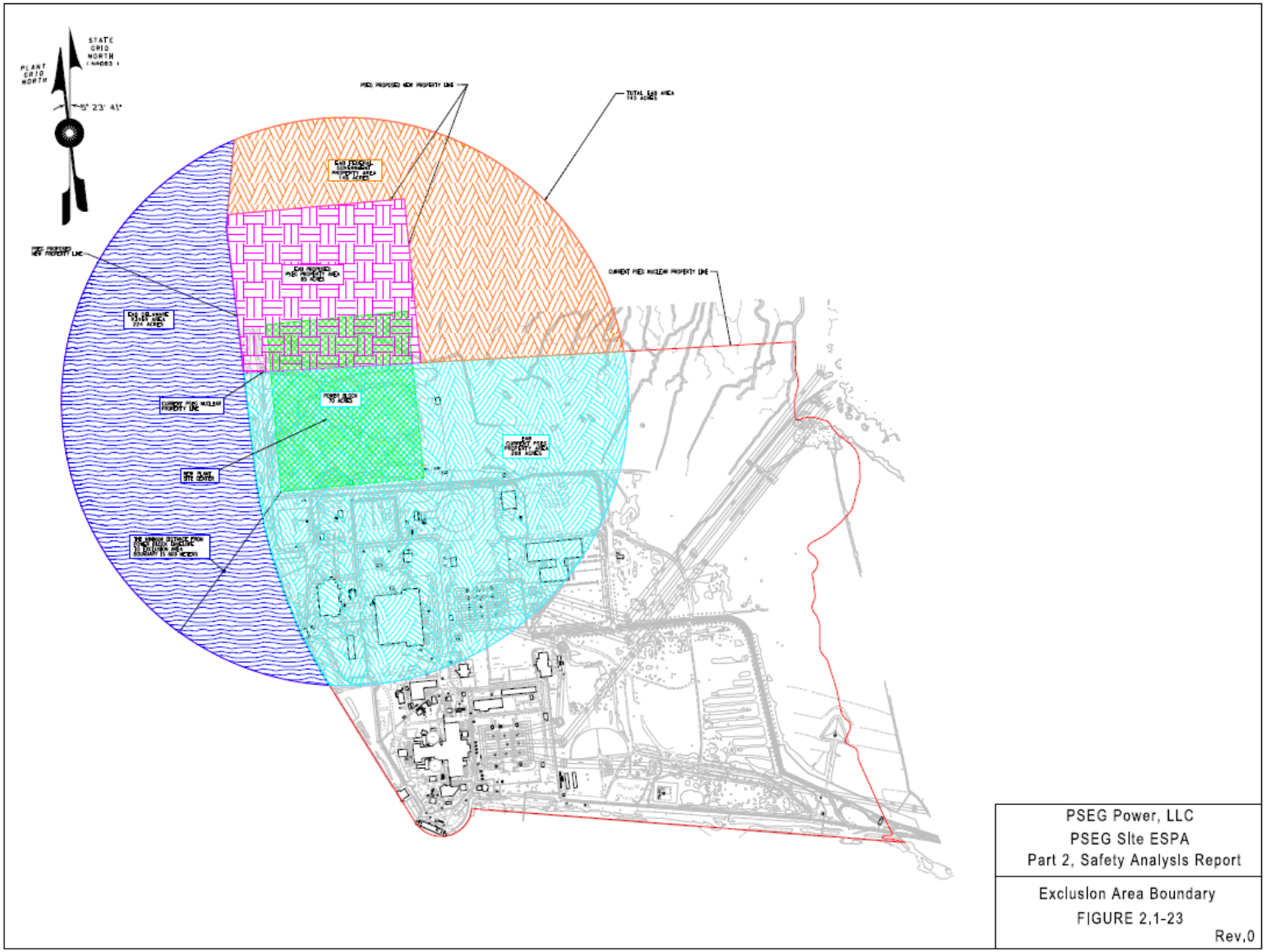
Existing Towers are Expected to be Adequately Exposed

- Towers are sufficiently far from the new plant to minimize effects from building wakes
- Local topography is flat and without significant vegetation
- Instrument shed is too short (12-ft tall) to adversely affect measurements
- Annual joint data recovery of 33 ft. wind speed/direction and 33 ft.-150 ft. delta-T exceeded 95% for the primary tower in 2006-2008 (Table 2.3-29)

Subsection 2.3.4 – Short-Term (Accident) Diffusion Estimates

- Short-term X/Q determined using 3 years of site meteorological data
- Exclusion Area Boundary (EAB) and low population zone (LPZ) measured from new plant power block envelope boundary
- EAB X/Q determined without accounting for reduction due to building wake effect
- Ground level release
- PAVAN computer program to calculate X/Q values at EAB and LPZ

Subsection 2.3.4 – Short-Term (Accident) Diffusion Estimates



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Subsection 2.3.4 – Short-Term (Accident) Diffusion Estimates

- Results (use maximum 0.5% sector dependent X/Q)
  - Site EAB X/Q (sec/m^3):

    0 – 2 hr: 4.71E-04

  - Site LPZ X/Q (sec/m^3):

    0 – 2 hr: 2.08E-05

    0 – 8 hr 8.47E-06

    8 – 24 hr 5.50E-06

    1 – 4 days 2.15E-06

    4 – 30 days 5.60E-07

  - All X/Q are below DCD X/Q values (See SSAR Chapter 15)
  - Uncertainty – Regulatory Guide 1.145, Section C.4

Subsection 2.3.5 – Long-Term (Routine) Diffusion Estimates

- X/Q and D/Q values calculated using NRC-sponsored XOQDOQ computer program
- Distances to the site boundary, nearest resident, nearest milk/meat animals and nearest vegetable garden measured from new plant site center (center of power block).
- X/Q determined using 3 years of site meteorological data
- Ground level release
- X/Q determined without accounting for reduction due to building wake effect

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Protecting People and the Environment

Presentation to the ACRS Subcommittee

Safety Review of the PSEG Site Early Site Permit Application

Presented by

Prosanta Chowdhury, Project Manager

NRO/DNRL/LB1

September 29 and 30, 2014

Purpose

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- Brief the Subcommittee on the status of the staff's safety review of the PSEG Site early site permit (ESP) application

- Support the Subcommittee's review of the application and subsequent interim letter from the ACRS to the Commission

- Address the Subcommittee's questions

Meeting Agenda

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- PSEG Site ESP Project Overview
- Schedule Milestones
- Key Review Areas:
  - Geography and Demography & Nearby Industrial, Transportation, and Military Facilities
  - Meteorology
  - Geology, Seismology, and Geotechnical Engineering
- Advanced Safety Evaluation (ASE) with no Open Items (OIs) Conclusions
- Presentation Conclusion
- Discussion / Questions

Completed Milestones

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- Received PSEG Site ESP Application - 5/25/2010
- Acceptance Review Completed - 8/4/2010
- Inspections / Site Visits/ Audits:
  - Pre-application Site Visit – 1/2008
  - Emergency Planning - 5/2010
  - Hydrologic Engineering - 2/2011, 2/2014
  - Quality Assurance - 5, 6/2011
  - Geology Site Audit - 9/2011
  - Meteorology - 5/2012
  - Seismic Software Audit – 9/2013
- Phase A - RAIs issued – 9/2013
- Advanced SE (ASE) with no OIs Issued – 10/2013 through 07/2014 (except Hydrologic Engineering ASE)

Safety Evaluations Presented

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On March 19, 2014, NRC staff presented ASEs with no OIs to ACRS Subcommittee on -

- Chapter 3, Section 3.5.1.6, “Aircraft Hazards”
- Chapter 11, Sections 11.2&11.3 (combined), “Radiological Effluent Release Dose Consequences from Normal Operations”
- Chapter 13, Sections 13.3&14.3.10 (combined), “Emergency Planning” and “Emergency Planning Inspections, Tests, Analyses and Acceptance Criteria (EP ITAAC)”
- Chapter 15, Section 15.0.3, “Radiological Consequences of Design Basis Accidents”
- Chapter 17, Section 17.5, “Quality Assurance Program Description”

Remaining Milestones

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- ASE with no OIs to be Issued:
  - Hydrologic Engineering – TBD
- ACRS Subcommittee Meeting on:
  - Hydrologic Engineering – TBD
- ACRS Full Committee Meeting – TBD

PSEG Site ESP Application

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- Proposed ESP Site located in Lower Alloways Creek Township, Salem County, NJ (30 miles southwest of Philadelphia, PA, 7.5 miles southwest of Salem, NJ)
- Adjacent to and north of Hope Creek Generating Station (HCGS)
- ESP applicants: PSEG Power, LLC and PSEG Nuclear, LLC (PSEG)
- ESP Application for a single- or a dual-unit reactors

PSEG Site ESP Application

U.S.NRC
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- PSEG developed Plant Parameter Envelope (PPE) using 1-Unit U.S. EPR, 1-Unit ABWR. 1-Unit US-APWR, and 2-Unit Passive AP1000; New plant may also be a different design that falls within the PPE
- PSEG requests permit approval for a 20-year term
- PSEG does not seek approval for limited work authorization (LWA) activities
- PSEG seeks approval for complete and integrated emergency plans with ITAAC as part of ESP

Acronyms

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- ASCE/SEI – American Society of Civil Engineers/Structural Engineering Institute
- CEUS-SSC – Central Eastern United States-Seismic Source Characterization
- COL – Combined License
- CP – Construction Permit
- DC – Design Certification
- EAB – Exclusion Area Boundary
- ESP – Early Site Permit
- GMRS – Ground Motion Response Spectra
- HCGS – Hope Creek generating Station
- ISG – Interim Staff Guidance

Acronyms

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- ITAAC – Inspections, Tests, Analyses and Acceptance Criteria
- LPZ – Low Population Zone
- PPE – Plant Parameter Envelope
- SER – Safety Evaluation Report
- SGC – Salem Generating Station
- SSAR – Site Safety Analysis Report
- SSC – Structures, Systems, and Components
- SSE – Safe Shutdown Earthquake
- USACE – United States Army Corps of Engineers
- USCG – United States Coast Guard

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Chapter 2, Section 2.1 & 2.2

Geography and Demography & Nearby Industrial, Transportation, and Military Facilities

(ASE ADAMS Accession No. ML14203A225)

Principal Contributor

Seshagiri "Rao" Tammara

Key Review Areas

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- **2.1 Geography and Demography**

  Staff performed review and analysis for the following:

  - **2.1.1 Site Location and Description**
    - Coordinates, site boundaries, orientation of principal plant structures, location of highways, railroads, waterways that traverse the exclusion area
    - Staff finds that the applicant has addressed the information adequately and is acceptable in meeting the requirements of 10 CFR 52.17(a)(1), 10 CFR 100.3, and the radiological consequence evaluation factors in 10 CFR 50.34(a)(1).

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- **2.1.2 Exclusion Area Authority and Control**
  - Legal authority, control of activities unrelated to plant operation, arrangements for traffic control
  - In absence of ownership and control at the ESP stage, the applicant proposed a condition, including SSAR changes, regarding planned acquisition of 85 acres of land as well as full control and legal authority from USACE, which controls Federal Government owned land of 146 acres. Staff identified this as **Permit Condition 1** in the SE, as well as corresponding **Confirmatory Item 2.1-1** regarding incorporation of the SSAR changes in the next revision of ESP application.

- **2.1.2 Exclusion Area Authority and Control (cont'd)**

Permit Condition 1: COL applicant must notify NRC when authority and control over the Exclusion Area is completed prior to issuance of COL, and the basis for that conclusion, including the following agreements:

- COL applicant must complete acquisition of 85 ac. of land, including mineral rights, from USACE that is currently part of the confined disposal facility north of the site;
- COL applicant must modify existing PSEG Site Radiological Emergency Response Plan and Security Plan, and reach agreements with USCG, to extend protections for Delaware River portion of the existing Salem and Hope Creek Exclusion Area to cover Delaware River portion of the Exclusion Area related to ESP;
- COL applicant must reach agreement with USACE for any land within the EAB that will not be owned by the COL applicant to obtain legal authority from USACE to either allow the COL applicant and its surrogates to determine all activities including exclusion or removal of personnel and property from the area or require that USACE exercise that control in a specified manner.

- **2.1.2 Exclusion Area Authority and Control (cont'd)**

Staff finds that the applicant has provided details on current and future agreements concerning its plans to acquire land and/or legal authority to determine or control all activities within the designated exclusion area.

Staff concludes that subject to Permit Condition 1 and resolution of Confirmatory Item 2.1-1, the applicant's designated exclusion area meets the requirements of 10 CFR 50.34(a)(1), and 10 CFR 52.17(a)(1), and 10 CFR Part 100 in determining the acceptability of the PSEG Site.

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- **2.1.3 Population Distribution**
  - Current and future population projections, characteristics of the LPZ, population center distance, and population density
  - **Staff finds** that the applicant has provided **sufficient and acceptable** description of current and projected population distribution, low population zone, population center distances, and population densities in and around the PSEG Site, and the information **meets the requirements of** 10 CFR 50.34(a)(1), 52.17(a)(1)(viii), and 10 CFR Part 100.

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- **2.2 Nearby Industrial, Transportation, and Military Facilities**

  Staff performed review and analysis for the following:

  - **2.2.1 Identification of Potential Hazards in Site Vicinity**
    - Maps of site and nearby significant facilities and transportation routes
    - Description of facilities, products, materials, and number of people employed
    - Description of pipelines, highways, waterways, and airports
    - Projections of industrial growth

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- **2.2.1 Identification of Potential Hazards in Site Vicinity (cont'd)**
  - **Staff** reviewed the applicant's information pertaining to the location and description of Nearby industrial, Transportation and Military Facilities for the evaluation of potential hazards for safe operation of the proposed plant, and **concludes** that all potentially hazardous activities on site and in the vicinity of the plant have been identified, and the information **meets the requirements of** 10 CFR 52.17(a)(1)(vii), 10 CFR 52.17(a)(1)(ix), as well as 10 CFR 100.20(b) and 10 CFR 100.21(e).

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- **2.2.2 Descriptions of Locations and Routes**

  Staff's review and conclusion on this Section is documented in Section 2.2.1 of the safety evaluation

- **2.2.3 Evaluation of Potential Accidents**

  Staff performed review and analysis for the following:

  Design-Basis Events: Accidents having a probability of occurrence of 10^{-7} per year or greater and resulting in potential consequences exceeding 10 CFR 100 dose guidelines -

  - Explosions and Flammable Vapor Clouds – Industrial Facilities, Truck Traffic, Pipelines, Waterway Traffic
  - Release of Hazardous Chemicals - Transportation Accidents, Major Depots, Storage Areas, Onsite Storage Tanks

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- **2.2.3 Evaluation of Potential Accidents (cont'd)**

Design-Basis Events (cont'd):

- Fires – Transportation Accidents, Industrial Storage Facilities, Onsite Storage, Forest
- Radiological Hazards – Hope Creek, Salem Generating Station

- The **applicant's determined minimum safe distance**, due to potential explosion from the gasoline storage tank and gasoline delivery tanker truck to the storage tank at Hope Creek Generating Station without exceeding 1.0 psi over-pressure at the nearest PSEG safety related structure, **is greater than the actual distance**, and therefore, the applicant committed to relocate the HCGS gasoline storage tank during new plant construction and reanalyze impacts of the relocated tank and delivery tanker truck. Staff identified this as **Permit Condition 2**.

- **2.2.3 Evaluation of Potential Accidents (cont'd)**

Permit Condition 2

A COL applicant referencing this early site permit shall demonstrate that the nearest structures, systems, and components (SSCs) important to safety of the selected plant design can withstand the effects of potential explosions associated with the relocated gasoline storage tank and the gasoline delivery tanker truck. The applicant shall demonstrate this by using the methodologies provided in RG 1.91 and RG 1.78 for direct explosion and vapor cloud explosion, respectively, to **confirm that a minimum safe distance exists between the nearest plant SSCs important to safety and the relocated gasoline storage tank and the gasoline delivery tanker truck** such that the SSCs would not experience an overpressure in excess of 1.0 psi in the event of an explosion.

- **2.2.3 Evaluation of Potential Accidents (cont'd)**
  - **COL Action Item 2.2-1** (In absence of reactor technology at ESP stage, Control room (CR) characteristics are unknown, and therefore, CR habitability cannot be evaluated. COL applicant will evaluate chemicals that lead to concentration above the Immediately Dangerous to Life and Health (IDLH) at the power block boundary when a reactor technology is selected) (*SE Section "2.2.3.4.2 Toxic Chemicals"*)
  - **COL Action Item 2.2-2** (In absence of reactor technology, at ESP stage, onsite chemical storage is unknown; COL applicant will evaluate when a reactor technology is selected) (*SE Section "2.2.3.4.2 Toxic Chemicals"*)

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- **2.2.3 Evaluation of Potential Accidents (cont'd)**

- Based on the review of applicant's information and analyses related to site specific evaluations of potential accidents, and staff's independent confirmatory analysis, **staff finds** the applicant's conclusions to be consistent with the guidance provided in NUREG-0800, Section 2.2.3, **with the exception of** potential impacts from the gasoline storage tank and gasoline delivery to the storage tank at Hope Creek Generating Station.

- **Staff concludes** that **subject to Permit Condition 2**, the ESP applicant has established site characteristics and design parameters **acceptable to meet the requirements of** 10 CFR 52.17(a)(1)(vii), 10 CFR 52.17(a)(1)(ix), 10 CFR 100.20(b), and 10 CFR 100.21(e) for determining the acceptability of the proposed PSEG Site.

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Chapter 2, Section 2.3

Meteorology

(ASE ADAMS Accession No. ML103090303)

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Key Review Areas

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- Staff held a site audit at the PSEG site and surrounding area on May 7-8, 2012
- Audit topics included:
  - Site location and exposure of instruments
  - Meteorological tower inspection and overview
  - Data quality assurance program
  - Meteorological data submitted in support of the ESP application
- For the ESP Site, PSEG chose to use the meteorological tower now in use for Salem and Hope Creek operating site

- **2.3.1 Regional Climatology**

Staff performed review and analysis for the following –

- Tornado/Hurricane Wind Speed and Associated Missiles
  - Site characteristic and staff confirmatory analysis values derived from RG 1.76 and RG 1.221
- 100-year Wind Speed (3-second gust)
  - Confirmatory analysis values derived using ASCE/SEI 7-05
- Maximum Roof Load (Winter Precipitation)
  - Methodology followed DC/COL-ISG-007
- Air Temperature and Humidity
  - Acquired hourly National Weather Service data from Wilmington and Dover, DE, Millville, NJ, and Philadelphia, PA to use as basis for confirmatory analysis of site characteristic dry and wet bulb temperatures

Staff concludes that the identification and consideration of the climatic site characteristics are acceptable and meet the requirements of 10 CFR 52.17(a)(1)(vi), 10 CFR 100.20(c), and 10 CFR 100.21(d)

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- **2.3.2 Local Meteorology**
  - PSEG provided detailed information showing that the PSEG meteorological data are representative of the site area
  - NRC Staff and PSEG ESP SSAR compared the following atmospheric phenomena recorded at the PSEG site against regional NWS reporting stations:
    - Onsite wind speed and direction
    - Wind direction persistence
    - Atmospheric stability
    - Ambient temperature and humidity
    - Precipitation
    - Fog
    - Air quality and potential influence of the plant and related facilities on local meteorology

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- **2.3.2 Local Meteorology (cont'd)**
  - **Staff concludes** that the applicant's identification and consideration of the meteorological, air quality, and topographical characteristics of the site and the surrounding area meet the requirements of 10 CFR 52.17(a)(1)(vi), 10 CFR 100.20(c), and 10 CFR 100.21(d), and are sufficient to determine the acceptability of the site.
  - **Staff also reviewed** available information relative to severe local weather phenomena at the proposed PSEG Site and in the surrounding area. The staff concludes that the applicant has identified the most severe local weather phenomena at the proposed PSEG Site and surrounding area.

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- **2.3.3 On-site Meteorological Measurements Program**
  - PSEG described the on-site meteorological measurements program and provided the resulting meteorological data
  - **Staff completed** a quality assurance review of the onsite meteorological data submitted by PSEG as part of the ESP application. This review included quality assurance of:
    - All measured meteorological variables
    - Location and exposure of instruments
    - Instrument maintenance
  - PSEG meteorological tower conformed to RG 1.23 criteria for siting of the tower in relation to the proposed PSEG and existing Salem / Hope Creek sites
  - **Staff concludes** that the onsite meteorological monitoring system provides adequate data to represent onsite meteorological conditions as required by 10 CFR 100.20 and 10 CFR 100.21

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- **2.3.4 Short-Term (Accident) Diffusion Estimates**
  - Staff independently created a Joint Frequency Distribution (JFD) from the onsite meteorological data to be used as part of the input files for the PAVAN computer model
  - PAVAN computer model output provides χ/Q for all sectors along the EAB and LPZ
  - All PSEG site characteristic values presented in SSAR Section 2.3.4 have been found to be acceptable
    - EAB & LPZ χ/Q values
  - **Staff concludes** that the applicant has established site characteristics and design parameters acceptable to meet the requirements of 10 CFR 52.17(a)(1)(ix), 10 CFR 100.21(c)(2), and 10 CFR 100.20(c)

- **2.3.5 Long-Term (Routine) Diffusion Estimates**

  - Staff generated JFD for use in XOQDOQ computer model to determine χ/Q and D/Q values for all receptors of interest. The staff identified COL Action Item 2.3-1 as stated below:

    COL Action Item 2.3-1

    A COL applicant referencing this early site permit should verify specific release point characteristics and specific locations of receptors of interest used to generate the long-term (routine release) atmospheric dispersion site characteristics. Any different exposure pathways and dose receptor locations, including those in sectors adjacent to the Delaware River, should be identified and discussed in order to demonstrate that long-term release atmospheric dispersion estimates fall within the site characteristic values in the ESP and to provide assurance of compliance with NRC dose requirements.

- **2.3.5 Long-Term (Routine) Diffusion Estimates (cont'd)**

  - Applicant provided meteorological data and an atmospheric dispersion model that is appropriate for the characteristics of the PSEG Site and release points. The staff's review confirmed that the applicant addressed the required information relating to long-term diffusion estimates, and there is no outstanding information to be addressed in the SSAR related to this review.

  - **Staff concludes** that representative atmospheric dispersion and deposition conditions have been calculated for specific locations of potential receptors of interest. The characterization of atmospheric dispersion and deposition conditions meet the requirements of 10 CFR 100.21(c)(1) and are appropriate for the evaluation to demonstrate compliance with the numerical guides for doses for any individual located offsite contained in 10 CFR Part 50, Appendix I.

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