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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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US EPR SUBCOMMITTEE

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WEDNESDAY

NOVEMBER 6, 2013

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

DANA A. POWERS, Chairman

J. SAM ARMIJO, Member

SANJOY BANERJEE, Member

CHARLES H. BROWN, JR. Member

HAROLD B. RAY, Member

JOY REMPE, Member

PETER G. RICCARDELLA, Member

MICHAEL T. RYAN, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:

KATHY WEAVER

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

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

(8:31 a.m.)

CHAIRMAN POWERS: Let's come into session. This is a meeting of the Advisory Committee on Reactor Safeguards, U.S. EPR Subcommittee. I'm Dana Powers, chairman of the subcommittee. ACRS members in attendance include Dick Stillman, John Stetkar, Mike Ryan and Sam Armijo, the esteemed chairman of the ACRS so we've got to be on our best behavior.

MEMBER ARMIJO: Yes, sure.

CHAIRMAN POWERS: So we've got to be on our best behavior here or he will report us to the appropriate authorities. Steve Schultz has been called away to work on Fukushima related things. And Sanjoy Banerjee is dutifully studying GSI-191 to help us in the future.

Kathy Weaver is essentially functioning in the committee and is also our designated federal official for this particular meeting. So we've got to be nice to her as opposed to the rest of time, right?

MS. WEAVER: That's right.

CHAIRMAN POWERS: The purpose of this meeting is to continue our review of the Safety Evaluation Report with Open Items for the combined license applications submitted by UniStar Energy for the Calvert Cliffs Nuclear Power Plant Unit 3.

We will hear presentations and discuss portions of Chapter 2, Site Characteristics, specifically Section 2.4, Hydrologic Engineering. And I will just note parenthetically that that particular section was a challenging, mildly challenging part of some of our early site permit applications, so we've centered it out specifically just because of that past experience.

That is not to say we have any challenges here for Calvert Cliffs. It only says that we had challenges in some of the early site permit activities. And Chapter 9, Auxiliary Systems.

The subcommittee will hear presentations by and hold discussions with representatives of UniStar and the NRC staff and any other interested parties. The subcommittee will gather information with plans to take the results of these reviews along with other reviews by the subcommittee to the full committee at a future full committee meeting.

And I think that future is now December?

MS. WEAVER: It is, December the 5th.

CHAIRMAN POWERS: December the 5th, is our definition of the future for the purposes of this meeting. I mean we're trying desperately to get this through in this calendar year. The scheduling doesn't take priority over technical content, but we're not trying to dilly-dally here. We want to move this along as best we can.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register. There is a bridge line established in the meeting room for members of the public which is set for a listen in only mode. And I understand we're going to have a line for talk.

MS. WEAVER: Well, that would be a little difficult. So what we may do with your permission is when the gentleman from PNNL needs to speak we'll open up the public line. Because right now there are no one on that.

CHAIRMAN POWERS: Okay. Well, that should work somehow.

MS. WEAVER: We're going to try that.

CHAIRMAN POWERS: We'll see how it works, and if it doesn't work we'll try something else.

MS. WEAVER: Okay.

CHAIRMAN POWERS: We have received no requests from members of the public to speak at today's meeting. A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice. Therefore, we request participants in this meeting to use the microphones located throughout the meeting room when addressing the committee.

Participants should first identify themselves and speak with sufficient clarity and volume so they may be readily heard. And that identify yourself is a fairly important part of this because otherwise the transcript has no clue what strange voice has suddenly appeared. Copies of the meeting agenda and handouts are available in the back of the room.

Before I start the general proceedings, do any members of the subcommittee have any opening remarks they want to make about this? General topics. Seeing none, then I'm going to follow our usual practice and ask Mike Takacs to give us some opening comments and help guide us through an all-day meeting.

MR. TAKACS: Thank you Dr. Powers. Good morning, and good morning committee members. My name is Mike --

CHAIRMAN POWERS: Surinder doesn't like us? Is this -- he's had enough of us, is that it?

MR. TAKACS: I won't speak for him just yet. I recently transferred into this branch from the U.S. APWR after five and a half years as a project manager. I've taken the role as the lead project manager for Bell

Bend subsequent COLA, which is the subsequent COLA to Calvert.

Today is pretty much, well, let me just step back for a second. Surinder Arora is on vacation, so I'm standing in --

CHAIRMAN POWERS: Vacation? Oh.

MR. TAKACS: I have to stand in for Surinder for the month of November.

CHAIRMAN POWERS: So we will definitely look for some extra activities on his return, right?

MR. TAKACS: I plan on transferring as much as possible back to Surinder --

CHAIRMAN POWERS: That's good.

MR. TAKACS: -- when he's returning. John Segala is the branch chief. He's not available today as well.

Today from what I see is a major milestone for this phase 2 review of Calvert. We have the final scheduled phase 2 sections, 2.4, as you mentioned, Dr. Powers, and Chapter 9, which will complete the SE sections with open items. It's a very important pivotal milestone that we're getting to today. Any actions or any activity I will do my best to relay back to Surinder upon his return.

For the first portion of the meeting though as we kick off, we will be hearing from Mark Finley from UniStar. He's the president, CEO and CNO. He'll present the Section 2.4 which is the hydrologic engineering section. I have no further comments at this time, so with that I can turn this back to you, Dr. Powers, or bring up --

CHAIRMAN POWERS: Yes, Mike, you're absolutely right. Once we have completed this, then we will move from phase 3 to phase 4 on this activity. And I certainly see that as very important to do. We can do that only if there are no technical objections to that. But we do have some flexibility to resolve open items in phase 4.

MR. TAKACS: Understood.

CHAIRMAN POWERS: And so we kind of have to use a judgment on that on moving this thing through. But I'm optimistic.

MR. TAKACS: So am I. That's why I came to the group.

CHAIRMAN POWERS: Okay, so thanks Mike for starting us off. Mr. Finley, are you ready?

MR. FINLEY: Yes, sir.

CHAIRMAN POWERS: Welcome back Mark.

MR. FINLEY: Thank you Dr. Powers, good to be here. And thanks to Michael, Surinder obviously, Kathy, and the subcommittee for keeping this schedule even through the government shutdown. We appreciate that. As has been said, this is an important milestone for UniStar and as is the December 5th meeting to close out phase 3. So thank you for that.

CHAIRMAN POWERS: And I will just interject that the end of this meeting, the subcommittee really owes it to both the staff and the applicant to give them some guidance on what that 5th meeting should entail, and there clearly has to be far more summary than what we have here, because I think we only have two hours for that don't we?

MS. WEAVER: That's correct. That's all we have on the agenda right now.

CHAIRMAN POWERS: The chairman is very parsimonious with the fact of the time he allows us. So if any of the members have thoughts on what should be presented to the full committee we will try to summarize that at the end.

MR. FINLEY: We would very much appreciate that. Thank you.

CHAIRMAN POWERS: In the past we've not been able to give much guidance.

MR. FINLEY: Okay, so by way of introduction I think most of you know me, Mark Finley.

I've been with UniStar for seven years. Before that with Constellation about 19 years, and before that Nuclear Navy. I graduated from the Naval Academy in, professional engineer, state of Maryland.

So we have a lot of material here for you today in 2.4. I think there's about 50 slides. We have about an hour and a half on the agenda for the UniStar presentation and then there's a staff presentation after that. But even so, the 50 slides is going to be a lot of information so I will go through quickly. But I encourage you to stop me. If you have questions on any slide we'll try to get you the answer there.

We do have one more expert that's on his way up, a slight technical difficulty this morning. So the staffer from Bechtel should be here shortly if there's questions for him.

But okay, so to start Slide 2, John. So as we said, the RCOLA is written using the Incorporate By Reference methodology so we rely heavily of course on the U.S. EPR FSAR from AREVA. But however in Section 2.4, like in Chapter 9 it's mostly --

CHAIRMAN POWERS: If you could just --

MR. FINLEY: In Section 2.4 in Chapter 9 later this afternoon it's mostly site-specific, so that's part of the reason there's a lot of material here today. You did cover Chapter 2 with AREVA way back on November 3rd of 2009.

CHAIRMAN POWERS: Question. Do you have a corporate memory?

MR. FINLEY: So Slide 3, we have no departures or no exemptions on Section 2.4, and there are no contentions open. There are 15 COL items and we'll discuss all of those today.

Slide 4, to continue the introductions, so we have some experts supporting me here today. We have Jamie from Rizzo who is our hurricane guy if we have questions about the hurricane. Shankar from Bechtel who is all-around Bechtel scope project manager. Bob Randall who is my engineering manager at UniStar. John Rucki who is operating the computer for me today.

So Slide 5, actually, move to Slide 7. We'll just get right into it. So first COL item is the applicant will provide a description of the hydrologic characteristics of the plant site. I think the best way to do that is to look at Slide 9. John, if you could go to Slide 9.

It's a nice picture of the Calvert County Peninsula in southern Maryland. You can see a red circle there where the site is located. So it's on the Chesapeake Bay which is probably the most important hydrologic feature for the site.

The peninsula on the west side is bounded by the Patuxent River. That is a tidal river in that area so that's important for later. And of course Chesapeake Bay is also quite a large body of water. St. Leonard Creek you can see is -- I don't know if the pointer will show up there, John, or not.

Yes, so that smaller body of water there is St. Leonard Creek, and we have Johns Creek which actually is a tributary of St. Leonard Creek which moves roughly from the site to that body of water, and we'll be talking about that a little bit later on. Those are the main aspects hydrologically.

Slide 8 talks about, and we'll show better diagrams of this later that the main block, power block of safety structures is actually up pretty high above the Bay, about 85 foot above sea water level of the Bay so it's really not threatened by Bay flooding scenarios. We do have one safety structure, however, which is on the Bay, roughly a ten-foot grade and we'll talk about that.

So it is subject to some of the flooding issues around the Bay. But it's purpose, that structure is to house the ultimate heat sink makeup pumps which are relied on for the Calvert Cliffs site after 72 hours to provide makeup to the basins for the UHS cooling towers.

So the basins have about 72 hours of water, but before 72 hours expires we need to be able to provide makeup from the Chesapeake Bay. So that's the function of the structure that's on the Bay. And we'll come back to that in some detail.

Okay, Slide 10 actually shows maybe a little better diagram of where the power block is, and I think if you look hard you can see Johns Creek which we'll talk about, which flows essentially from east to west as I mentioned towards St. Leonard Creek, and we'll talk about the some of the flooding evaluations that were done on Johns Creek.

The dotted line there roughly depicts the drainage divide, so water to the left, you know, flows to the west there towards the Patuxent River and to the right flows back to the Chesapeake Bay.

MEMBER SKILLMAN: Is that a natural ridge?

MR. FINLEY: Yes, right now that's a natural ridge. I believe it'll be altered slightly when we do grade the plant, but not significantly.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Yes. Okay, Slide 11. So we'll start with perhaps the easy ones first. So dams and reservoirs, essentially there are no dams on the St. Leonard Creek which is that body of water we pointed out to the west of the site.

There are two dams fairly fair upstream on the Patuxent River about 75 and 85 miles upstream. We have looked at potential failures of these dams. There's really no influence at the site if those dams were to fail, even both of them were to fail.

There is a slight influence, I think, at the mouth of the St. Leonard Creek and Patuxent River a couple of feet, but by the time you get around to the Chesapeake Bay there's really no effect on the site.

So I think with respect to dams and dam failure that's not a concern for the Calvert Cliffs site. As far as surface water usage, nearby of course we do have, and this is with respect to the Chesapeake Bay, really. In the vicinity of the Calvert Cliffs 3 site we do have Calvert Cliffs 1 and 2. And they draw a once-through cooling water but return it to the Bay, and I think in that sense we don't call it a surface water consumption on the Bay.

There are some smaller consumers of surface water on the Bay. You see them listed there, not a significant impact on the sites. Slide 12, to continue with the overall hydrologic characteristics. So ground water, we will have a desalination plant which will provide the fresh water needs for the site.

That desalination plant's going to be used to maintain the UHS cooling tower basins full so we'll have fresh water in those basins. I mentioned, before 72 hours we'll have the capability to provide Chesapeake Bay water to those basins.

That is brackish water, but normally we would have fresh water in the basins. That's going to be supplied by the desalination plant. The desalination plant will be used for normal makeup to the site, makeup to the fire water main or fire water tanks. That's our normal source of fresh water.

During construction we plan to have a well and we will be using fresh water from that well to supplement construction. And at this point in emergency situations during operations we would also rely on ground water using a well. Part of that is an open item with the staff that they will talk about later this morning.

MEMBER RYAN: What's the depth of where you're extracting the water?

MR. FINLEY: The depth is anywhere greater than about 600 feet. I don't know that I have a diagram of aquifers. Perhaps later we'll come to --

MEMBER RYAN: Okay, that's fine. I was curious how a well it's isolated throughout here, whether it communicates and how much. That kind of thing.

MR. FINLEY: Right. And part of the commitment is to do some testing prior to making use of that well during construction to make sure that we have adequate flow. But we do have some analysis ahead of time that shows it for the usage which is about 70 gallons a minute. For the usage that we need during construction there should not be a problem.

MEMBER ARMIJO: Is a desalination plant a unique feature as far as --

MR. FINLEY: I'm aware that --

MEMBER ARMIJO: I'm not familiar with any other plant that has --

MR. FINLEY: I believe Diablo Canyon also has a similar desalination plant. I'm not sure what the size of that plant compared to our proposal.

MEMBER ARMIJO: But you would operate it intermittently or would it be continuous operation?

MR. FINLEY: No, it would be continuous operation and we would design it so that it's very reliable, multiple, you know, redundant features. So of course subject to loss of all offsite power, but we think, and I think the experience we saw at Diablo Canyon is that these systems can be maintained very reliable. So we think normally we'll always have the desalination plant.

MEMBER ARMIJO: But it provides potable

water. It provides makeup to the fire water --

MR. FINLEY: Makeups of fire water.

MEMBER ARMIJO: So it's your basic water supply?

MR. FINLEY: It is the basic water supply. We will have a raw water system. Obviously we'll talk about that some. And a raw water system provides the input to the desalination plant as well as some other cooling water.

Yes, so the desalination facility is the key facility for the site in terms of operating normally. We rely on about, I think it was about 900 gallons a minute from that desalination plant. But we had done some benchmarking with the Diablo Canyon plant and they have a reliable plant. So I don't think it's unique in terms of --

MEMBER ARMIJO: But it's not Bay water you're treating, it's --

MR. FINLEY: Yes, it is.

MEMBER ARMIJO: It's actually water from Chesapeake Bay?

MR. FINLEY: That's correct. Yes. It's not ground water but water from the Chesapeake Bay. Yes. And ground water would only be used if the desalination plant were out of service for some reason.

MEMBER STETKAR: I was going to say, so you may want to answer Dr. Ryan's question. As I look through your slides, you don't have a good cross section profile that shows the different --

MR. FINLEY: Different aquifers?

MEMBER STETKAR: Yes, the different aquifers. There are a couple of pretty good ones in the FSAR so you may want to --

MR. FINLEY: Yes, I think we can come back with that maybe --

(Crosstalk)

MEMBER STETKAR: No, there is not. That's why I looked forward to see where it was, and it's not in here.

MR. FINLEY: Well, certainly if we get a little time in the break we can get the figure.

MEMBER STETKAR: It's only important because he's asking. You know, when you do your ground water pathways there is a vertical component down to -- I've forgotten the names of the --

(Crosstalk)

MEMBER STETKAR: But a down and out, if you will --

MR. FINLEY: Right. Right. So we'll come back to that.

MEMBER STETKAR: Thank you.

MEMBER SKILLMAN: Mark, did you say that the cooling tower basins are fed by the desalinated water supply?

MR. FINLEY: That's correct. And we'll have a more detailed figure to show. But the normal makeup to those basins is from the desalination plant, yes.

MEMBER SKILLMAN: And that makeup rate takes into consideration drift and evaporation during the summer?

MR. FINLEY: Yes.

MEMBER SKILLMAN: And your most dry days when you're evaporating?

MR. FINLEY: Yes, it does, and we'll cover that in a little more detail with a flow rate and so forth.

MEMBER SKILLMAN: So for the SSCs they're cooled by that water. To what extent are they dependent upon that water being desalinated?

MR. FINLEY: So, and again we'll touch on this a little in a slide too. So we have evaluated, since the desalination plant is not safety related and it relies on offsite power, we have the plan for the eventuality of not having the desalination plant and we've done that.

So we have makeup from the Bay, and we've evaluated the change in water quality based on using that brackish water from the Bay to make sure that the water still maintains the quality needed to not affect the SSCs in terms of safety functions. So you'll have another chance to look at some more details when I get to that slide.

But we've essentially evaluated the change to a brackish water environment with increased hold of dissolved solids, and we've evaluated the impact on SSCs and there is no effect for 30 days.

MEMBER SKILLMAN: Okay, I'd like to --

(Crosstalk)

MEMBER SKILLMAN: -- just for a second here. I'm thinking about some operating experience that showed leafy green vegetables growing in diesel generator jackets because it wasn't fresh water anymore it was actually raw water, other surprises such as that. And so I can understand a design based on desalinated water, but the brackish water brings an entirely different spectrum.

MR. FINLEY: Okay.

MEMBER SKILLMAN: As interrogators into your equipment, I would like us to be comfortable that you've really thought that through.

MR. FINLEY: I appreciate that as far as part of that -- well, let's wait until I get to the slide. I think there's more detail there.

MEMBER SKILLMAN: Thank you Mark.

MR. FINLEY: So I think we're done with Slide 12. Slide 13, shifting gears a little bit to talk about flooding. So as I mentioned previously, the main feature with respect to flooding of concern for the site is the Chesapeake Bay.

And we do have the one structure near the Bay in terms of the makeup structure. So we've looked hard at the varied flooding data, and in fact on Slide 14 show, I guess, the five highest floods for locales nearby.

Unfortunately we don't have, I would say, hourly recorded data at the operating units Calvert Cliffs 1 and 2, so this is the data that we had to go to, to go back a number of years on the Chesapeake Bay. And you can see roughly six, seven feet are the flood levels even through the storms that we've seen roughly over the last, well, this goes back, I guess, close to 100 years.

But with respect to the Calvert Cliffs 1 and 2 sites which are right next door, we do know that there's never been flooding since they've been operating, roughly late '60s, early '70s time frame that exceeded the ten-foot elevation which is roughly their grade for the structures they have on the Bay.

MEMBER STETKAR: These are, and they're an important point for the flooding analysis because these are all associated with hurricane storm surges. Did you measure, I'm sure you did. What was the storm surge during Sandy? Do you have that information? Because this data doesn't. I forgot the cutoff data. I think it's 2010 or something like that so it didn't pick up Sandy in that.

MR. FINLEY: Yes, this was cut off prior to Sandy. I would need to confirm this, but I really think there was not a significant flood on the Chesapeake Bay during Sandy. In fact I think there was actually a drawdown of the Bay because --

MEMBER STETKAR: You know, I tried to do some searches on the Internet and I couldn't find anything definitive except, you know, anecdotal news stories and things like that.

MR. FINLEY: I'll take an action to confirm that but it was not significant. I don't think there was any, to my knowledge Calvert Cliffs 1 and 2 plants operated through that and there was no significant flooding issues.

MEMBER STETKAR: The only reason I brought it up is the importance of the hurricane to the storm surge analysis and whether or not you captured the --

MR. FINLEY: I appreciate that and we'll talk more about the hurricane. What's actually worse for the Bay is the storm that moves up on the west side of the Bay, and of course Sandy was up north, and so the wind pattern was different. It's when the wind blows up the Bay.

Isabel, for example, you may remember, its September 2003. It's not long ago. I remember it well. There was a lot of trees down in Calvert County. So that was a storm that went through Virginia basically, and the winds were from the southwest up the Bay and they did flooding in downtown Baltimore. So that's more of a concern. And that's really the limiting hurricane that we'll talk about in a few minutes.

Slide 15, more flood considerations. We had looked at, I mentioned hurricanes of course, but we've looked at the probable maximum flood of the streams nearby the site. We'll talk about that. We have looked at the potential dam failures. I've touched on that a little bit.

And we've looked at the maximum surge and seiche associated with the hurricane, and the probable maximum tsunami as well related to landslides, and also ice effect flooding. So we've looked at all these scenarios in terms of their potential effect on flooding for Calvert Cliffs.

MEMBER STETKAR: Mark, are you going to talk anymore about the precipitation?

MR. FINLEY: Yes. On each of these type scenarios I mentioned we'll have specific slides. And I think we might talk about it later on, but the last bullet on Slide 15. So one of the things we looked at was Johns Creek. I mentioned that that's a tributary that runs essentially to the west and dumps into St. Leonard Creek and the Patuxent River. The maximum flooding level on that creek is 65 foot. That's roughly 20 feet below plant grade for the power block, so not a concern. A significant margin there.

MEMBER SKILLMAN: Just hold that thought for a minute. If you say the power block's at 85 feet, what SSCs are below 85 feet and are therefore subject to precipitation flooding or other water intrusions, say, through drains that when the plant was constructed were not constructed in the way that drain out with the higher water table?

MR. FINLEY: Okay, so there are a large number I would say, a large number of SSCs that are actually located in the structures, in the safety structures at levels below 85 feet. I couldn't list them here.

But we have a lot of measures, some of which we'll talk about on future slides here, that prevent ground water intrusion. We have margin to the surface water intrusion, et cetera. So we don't think that these SSCs are challenged by flooding. In the structures they're located below grade, so below the 85-foot elevation.

MEMBER SKILLMAN: How would you describe the thoroughness of the evaluation to confirm what you just said?

MR. FINLEY: I'll tell you what. I'm going to defer to Shankar and maybe he can help me on this. So introduce yourself, if you would, Shankar.

MR. RAO: Shankar Rao from Bechtel. I am with Bechtel for the last 33 years, and I have been on this project, UniStar's, U.S. EPR as well as Calvert Cliff's Unit 3 from 2005.

Specifically related to your question we have done calculations, detailed modeling and calculations associated with the flooding surface, and then our colleagues from Rizzo has done for the storm water surges and the effect of the flooding due to that.

And like Mark said, in addition to the

structures that are at 85 and above there are structures below 85, but we have provided storm drainage and other features associated with the probable maximum precipitation to divert water away from the safety related structures in such a way that water intrusion is not a factor into the building.

In addition to that we have also provided from underground waters, water proofing and dampproofing protection measures which will provide protection from any water seeping in from the bottom due to water table changes.

MR. FINLEY: We will actually have some additional diagrams with respect to the water proofing membrane that we use, in future slides. So you'll get another chance to follow up on that.

MEMBER SKILLMAN: I will. Thank you.

MR. FINLEY: Okay, Slide 16. So the structure with a hurricane in terms of these challenges, and again this is really only a concern for the UHS makeup intake structure on the Bay. We'll show you a diagram of that structure shortly.

But first just to show some of the numbers. Actually I think it's maybe easier seen on the Table on Slide 17, if you shift to Slide 17. So first of all, we calculate sort of the worst initial high tide before the hurricane hits and that's about four feet, and then it accounts for about an additional foot of sea level rise in the future for whatever reason.

And then on top of that we look at surge. And you can see in the bottom half of that Table there, the surge due to the hurricane is another 13.2 feet. We'll get into some details of that a little bit later. And then a wave runup on top of the surge, so that's the wave pushing against the structure itself. And a total of 33.2 foot has been calculated for the impact of the hurricane.

And the hurricane track was very conservatively selected. Of course the size of the storm was conservatively selected. The speed of the storm was conservatively selected to maximize all of these values here. To give you a feeling for the margin that we have given that result, so Slide 18 --

MEMBER STETKAR: Mark, let me interrupt you for a moment, because if you're going to get into water depths and things like that I'd like to explore the hurricane first a little bit, and I didn't see any slides on that because you're getting into water.

The hurricane that you've selected is, I believe, peak wind speeds at the site of 117 miles an hour. And wind speeds at landfall of 152.6, which makes it the high end of a Category 4 at landfall and right at the bottom of a Category 3 when it passes by the site.

The FSAR says that there are historical records of 12 hurricanes that have come up through that area in the last 156 years or 155 years or something like that. It's a pretty frequent event. I mean it's not a rare event in terms of things to do with that. I'm sure there is information. I couldn't find it or I didn't have the time to go look for it. What were the intensities of those hurricanes, the actual historical experience? Because this is not, it's your design basis hurricane, but I mean it's not the worst hurricane in the world. It's kind of a Category 3-4ish sort of hurricane which is pretty big for that part of the world, but I'm just curious about where it lies within the range of historical experience.

MR. FINLEY: Yes, so I'm going to ask for Jemie from Rizzo to chime in. I think he can answer much better than I.

MR. DABABNEH: Yes, I think the criterion here is whether the hurricane was going over water or over land. If it's over land you would see the wind speed is decreased. If it's over water the wind speed would be higher. So the rest of hurricanes that went through the Chesapeake Bay, some of them caused draw downs that caused surge.

So for the ones we developed, we developed those with all the track. We made sure that the site is on --

MEMBER STETKAR: Let me stop you because of time constraints. I understand what you did with model. You have wonderful computer models. But I'm asking you about history. I would like to know what the intensities of those 12 hurricanes that actually happened were. I know what you've done with the model.

MR. FINLEY: We have that data, Dr. Stetkar, and I think we can get that to you on a break perhaps. I do know that --

MEMBER STETKAR: I just never got a sense of --

MR. FINLEY: This hurricane is larger than any of those in terms of --

MEMBER STETKAR: That's the kind of --

(Crosstalk)

MEMBER STETKAR: -- I was looking for.

MR. FINLEY: We've never had a landfalling hurricane in Virginia, Maryland of this magnitude.

MEMBER STETKAR: That's the kind of confirmatory information that I was looking for, so if you can confirm that that's great.

MR. FINLEY: And I think as Jemie was saying, where it hit landfall is important.

MEMBER STETKAR: I understand. I don't do the kind of modeling so I don't, you know, I can't converse with you on what you actually do. But I understand what you did with the modeling.

MR. DABABNEH: And these parameters, like I think NOAA developed certain parameters for the total maximum hurricane based on the history of hurricanes. They came up with like central pressure or maybe it's the maximum wind that is worse than anything else that took place.

MEMBER STETKAR: The first question was item six on my list. You're a good straight man. And the second question is item seven. Those parameters were developed from National Weather Service Technical Report NWS 23, 1979 date, and you list the parameters.

And you use those parameters, moved your hurricane around, you know, looked at tracks, looked at directions, looked at, you know, things. But essentially you used those parameters in terms of pressure difference and size of the hurricane and things like that.

The question I had is that some recent, more recent analysis that were done to support guidance in Regulatory Guide 1.221 that was issued in July of 2011, it indicated that some of those very early National Weather Service barometric evaluations were indeed optimistic especially for coastal sites. And as a result of that a lot of the Gulf Coast at least has reindexed their probable maximum hurricane wind speeds and parameters.

I was curious whether you looked at that and how that might affect your parameters for the probable maximum hurricane at the Calvert Cliffs site, because you are using that old federal guidance. Did you look at the newer --

MR. FINLEY: I'm going to defer it to Jemie on that as well.

MR. DABABNEH: When we did the work the new guidance was not in effect. However, when we developed the track, the NOAA parameters were just at the mouth of Bay. When we developed it they were all parameters based on that.

We looked at the National Hurricane Center, which was basically a list of hurricanes and their central pressure and figures of maximum wind, and did some comparisons for the hurricanes that you think would cause the surge at the site. And I mean it was, I must say, they were exactly the same, but we went upon a range.

MEMBER STETKAR: Okay.

MR. DABABNEH: And I think now, frankly, NOAA is abating their SLOSH model to account for these new hurricanes, like Sandy and --

MEMBER STETKAR: Yes, and it's not just the SLOSH model but it's the historical, I mean if you want to use the term statistics, it's the way they did their analyses of historical hurricanes coming for U.S. landfalls. The wind analysis, you know, peak winds and stuff like that.

So that whole, the meteorological part of it, you know, has been updated. And I know it has had an effect along the Gulf Coast in southeastern U.S. I'm not as familiar with, you know, mid-Atlantic and northeastern sites. So I was curious whether you had looked at that and considered it.

MR. FINLEY: I think informally, I think that came out after we --

(Crosstalk)

MEMBER STETKAR: The data that, there was a NUREG and the updated, the Reg Guide was 2011. So it does post date the analyses that you've done.

MR. DABABNEH: But during the process, I just want to emphasize during the process you don't have an actual hurricane center. They list all the hurricanes with their statistics and we're just comparing them to --

MEMBER STETKAR: Okay, thanks.

MR. FINLEY: Yes, so on Slide 18, and I'm going to jump ahead for just a second, but let's stick with 18 just a moment. So this is a section view of the structure we have on the Bay. The grade is about ten foot. You can see that on the right hand side there that lowest level nominal ten-foot grade.

Up above that you see the maximum wave runup coincident with the numbers I showed you before, 33.2, so that's the surge and the runup which is the water pushing against that wall. And then the opening for ventilation is up above that roughly at 36'6". So roughly three foot of margin from that wave runup to the ventilation intake.

And I'll also say that just the orientation of this structure, so we're looking east. Essentially it's plant east, so you're actually looking a little to the northeast out toward the Chesapeake Bay. So the waves would be coming in, I would say, out of the page towards you, the viewer, here, not directly from the right or from the left on this particular drawing.

So that just shows you the margin that we have with respect to this worst case wave runup. I'm going to jump ahead --

MEMBER STETKAR: What's the setback, Mark? I couldn't find it easily. What's the setback from which you do your analysis on, you know, the maximum spring high tide? I don't care exactly where that is, but how far back from the shoreline -- I know that's a big concept -- is the building set?

MR. FINLEY: I'll tell you what. If you look on Slide 35 -- John. If you go ahead and look at Slide 35 we have maybe a better plan view picture. So that section that we were just looking at was essentially looking from lower left to upper right. So we were looking up toward the northeast, essentially toward where the waves would be coming from, and you can see the setback there. I don't think we have a footage. But that's roughly a ten-foot grade where the normal shoreline is, well, I don't know, a couple hundred feet maybe away from the structure. Something like that.

MEMBER STETKAR: You said a couple of hundred?

MR. FINLEY: Yes, so a hundred foot or --

MEMBER STETKAR: Okay. I had no, you know, none of the, they're always on the things, the drawings in the FSAR, most of them say not to scale or things like that. So I had no sense of -- a couple of hundred is fine. I was just curious about, you know, because of the wave models that you used, it just was a lot of attenuation over that --

MR. FINLEY: Yes. And actually to the point --

(Crosstalk)

MEMBER STETKAR: -- beach area or whatever.

MR. FINLEY: Let me interrupt, because I think I have a better slide. I'm moving around. I'm sorry about this. But Slide 31, if you go to Slide 31. I don't think there's a dimension on here but it shows --

MEMBER STETKAR: This is essentially what I was talking about.

MR. FINLEY: Right. It shows you that there is some land, if you will, between the normal shoreline and where the structure is that actually we take credit for in terms of reducing the wave size. So large waves would actually break on the normal shoreline, if you will, smaller waves would then reach the structure. And there is some runup to 33.2 feet but that's pretty significant. It's where sort of the green water reaches on the splash up the building.

MEMBER STETKAR: I was just curious about that horizontal. This is the drawing from the FSAR that I was referring to. And, you know, at the bottom it says not to scale so I --

MR. FINLEY: Maybe Jemie --

(Crosstalk)

MEMBER STETKAR: There's a couple hundred feet. That's close --

MR. DABABNEH: I think it's 100, 115.

MR. FINLEY: Okay, okay.

MEMBER STETKAR: Yes, fine. Thank you.

MR. FINLEY: Okay. Let's stick with the hurricane here. We got a little out of sync but --

MEMBER STETKAR: Yes, I'm sorry. You're talking about wave runups and things like that so --

MR. FINLEY: Yes. No, no, it's good. I'm glad that you're asking the hurricane questions now. So Slide 30, John. If we go to Slide 30, just to stick with hurricane. And I think we've talked about most of these things already.

And this is a little bit more analytically, we talked about the structure and the hurricane, I think, until now. This is more the analysis. So we used the sea, lake, overland surges from hurricanes model, SLOSH model, which is something requested actually by NRC staff, and we did that.

That's what was used with uncertainties to calculate these worst elevations. We did include a 20 percent uncertainty for the SLOSH model, and that's what resulted in the 33.2 overall elevation for the water. And again, Slide 31 just shows sort of the total, maybe a good visual picture of how that relates to the makeup water intake structure.

Okay, so I'm going to ask, are there any other hurricane questions? Because I think I've covered all my hurricane slides.

MEMBER SKILLMAN: Yes, I would ask one. Has anyone at the site who is involved in this project looked at the numbers and looked at the bluff down onto the Chesapeake and said, you know what, with a real runup this thing could get, we are not as robust as we think we are?

MR. FINLEY: Okay, so I'm going to ask if Shankar could comment in a second. So the shoreline, and actually Slide 31 might be the best place to talk about this. So the waves also break on the shoreline past the intake structure which I think is your point in terms of stability of the bluffs.

All of the natural bluffs are going to be changed and they'll be graded and they'll be reinforced with rip-rap and other materials to make sure that it's a stable slope. So that with respect to the hurricane and the wave action on the bluff we're not concerned about stability of the soil and any issues up on the power block. Maybe Shankar, you could comment more on that.

MR. RAO: Yes, stability of slope and all those analyses were performed for that, and any preparation for the intake structure area if there was a piece of, I think, mound or something I would call, would be cut to make that adjustment.

And then the rip-raps and others would be added for any effect of the waves that would, may erode the bluffs, at least those which are being prepared for the intake structure area. They would be that 200 feet from the intake towards the plant which would be graded along with adjustments for waves should anything exceed 11-1/2 foot elevation, which is our ten-foot elevation that is the grade of the prepared for the intake structure.

MEMBER SKILLMAN: Thank you.

MEMBER ARMIJO: Yes, on your Slide 35, I see you referred to another slide, but anyway, the intake, safety related intake pipes, what's the protection against debris blockage in the event of a hurricane for those?

MR. FINLEY: I'll tell you so as not to get too far out of sequence, can I ask you to hold that question?

MEMBER ARMIJO: Sure.

MR. FINLEY: Because we're going to come back to that. Let me go through the rest of the slides and build up to that point if I could.

MEMBER STETKAR: Yes, sorry to do that. You said you were going to talk about hurricanes first, early.

MR. FINLEY: We moved around too much.

MEMBER STETKAR: If you can go back to, I don't remember where you are, about 15 or so.

MR. FINLEY: Yes, like 18 or 19.

MEMBER STETKAR: Yes, okay. If we can go back to 18, your picture of the building. We kind of talked a little bit about storm surges and things. One of the questions I had, which is a building question, is that if you look at the elevations on this slide which obviously you can't see on the screen there, but the storm surge elevation is well above the floor level of the pump and electrical equipment which is nominally, grade level's ten feet, it's like 11-1/2 feet, I think, the floor levels if I remember right. It is stated in the -- most pump rooms I've been in, this is obviously not most pump rooms. The suction piping that comes up through the floor is typically, you know, you can look down and see water down there because you need clearances for thermal expansion and vibration and things like that. So it's typically an open suction line.

There's a statement in the FSAR that says that entire floor, if I will, or the roof of the forebay in that area will be sealed and watertight for any applied hydraulic loads. Now a storm surge can bring in quite a bit of hydraulic loads.

So I was curious. I couldn't find either, there was no discussion of it here. There was no discussion, I couldn't find it in Chapter 3. I couldn't find it in Chapter 9. I couldn't find it anywhere.

How are you going to seal that area, in particular the area around the suction pipes from the makeup pumps against that type of hydraulic load? That's got to be pretty --

MR. FINLEY: And actually, just before answering maybe just to show on the figure, John, right in the center of the figure you can see the vertical pump Dr. Stetkar's talking about, and then the floor where the suction line of the pump penetrates. That's, I think, the --

MEMBER STETKAR: That's exactly. You know, obviously I'm worried about, you've seen manhole covers blow off of sewers.

MR. FINLEY: Let me ask Shankar to address that.

MR. RAO: Yes, this pump has a barrel. And then through the barrel there is a shaft that runs the impellers down below. And the whole barrel will be either sealed with some kind of material in such a way that it allows for, especially because the temperature is not extreme for the water. It's pretty ambient.

Therefore, it could potentially just be grouted in place in the floor, because the barrel, it's just a barrel which brings water up and the shaft goes through that.

MEMBER STETKAR: Okay.

MR. RAO: Any seal that may be necessary for it will be designed for the load, it will seal during the --

MEMBER STETKAR: I can envision how you might do that. I've just never seen that kind of construction anywhere.

MR. RAO: They'll be done in new technique to the designs.

MEMBER STETKAR: Okay, thank you. Thank you.

MR. FINLEY: Okay. So we'll come back to the question about debris, I think, in the sequence of the slide, so if we don't hit that please stop me. Okay, so Slide 19. So we're going to shift to precipitation here now.

Precipitation, I would say, is the larger concern on the power block area. Now we're moving away from the Bay but up roughly 85 feet. And so we've analyzed using the approved methods and using the worst precipitation levels, which I'll show you in just a second, and looked at the drainage on the site and been conservative in terms of what kind of drainage we credit.

And we calculate with that worst scenario an elevation of the water on the power block area about 81.5 feet. And I'll show you what that looks like on a diagram in just a second. So it's about three feet below the 84.6 feet which is the lowest reactor complex entrance elevation.

So about three foot of margin, again with some quite conservative assumptions regarding the analysis. There's a table on the next page which shows, on Page 20, Slide 20, shows the precipitation assumptions we've made. Essentially eight and a half inches of rain in one hour. This is actually less than the U.S. EPR FSAR assumption which is 19.4 inches per hour in terms of the generic structure design which we incorporate from the design certification. And so it's a very significant rainfall obviously, but in accordance with approved references.

On Slide 21 we show for each of the structures up on the power block, the ultimate heat sink structures, the diesel building structures and then the reactor complex, what the entrance elevation is, what the peak water elevation is, and then margin that we have to those water elevations.

Let me just, one more slide before you ask questions. So Slide 22 is a plan view that shows the grading up on the power block area. And you can see kind of the bolder lines show the drainage ditches. It's actually, this is graded for two power blocks, so the Unit 3 power block is there onto the left and it shows we have a drainage away from the structures to the drainage ditches.

And again with the 19 inches of rainfall in an hour we calculated there will be some overflowing of the drainage ditches and water will back up to some extent on this grade, but we'll have margin to the entrances of those structures.

MEMBER STETKAR: I'm glad you're at this because I have the same thing up -- I think it's okay but I'm not a hydrological or whatever engineer. The peak elevations anyway that you show in that central ditch there, it's like 81-1/2 feet, I think.

What I was concerned about, you focus obviously on safety related structures and the power block. I was curious about the turbine building. And this, I think, but I'm not sure that the grade elevation of the turbine building is 83 feet, but I don't know whether it's 82 or 83. And I was curious about whether you'd get turbine building flooding during this event. It's not a safety related structure but --

MR. FINLEY: I understand, and let me ask Shankar. Do you know the entrance elevation for the turbine building?

MEMBER STETKAR: Because you certainly will, at grade level you're going to have big openings in the --

MR. RAO: 84'6".

MEMBER STETKAR: 84 feet?

MR. RAO: 84'6" is the nominal grade around the turbine building.

MEMBER STETKAR: At the turbine building. Okay, fine. Thanks.

MR. RAO: These other ones, the lowest one in this vicinity is the diesel --

MEMBER STETKAR: Yes. I mean that's pretty clear. I just couldn't tell from this because it looked like in compass direction what's the southwest end of the turbine building, or on this drawing, the bottom of this drawing, down where the pipe chases go through, I think those are pipe chases or transformers or something, I wasn't quite sure what the elevation was there.

Up closer to the power block it looks like 83 feet, so I'm assuming it was around 83 or so. You're saying it's even higher than that. Okay, thank you.

MEMBER ARMIJO: Are both the emergency diesel generators shown on this drawing at the same elevation?

MR. RAO: Yes. You mean on the left and the right?

MEMBER ARMIJO: Yes, left and right.

MR. FINLEY: All right, so if you look at Slide 21, Dr. Armijo, it shows the two diesel generator --

MEMBER ARMIJO: Yes.

MR. FINLEY: -- structures, so that they're both at the same grade elevation. And I think we have a better slide to come back to your question about components below grade in these structures, so I'm not forgetting that you have --

MEMBER SKILLMAN: I'd like to ask forgiveness and go back to Page 18 for a minute.

MR. FINLEY: You are forgiven, by me anyway. Dr. Powers can overrule it.

MEMBER SKILLMAN: John's question --

CHAIRMAN POWERS: Wouldn't dream of it.

MEMBER SKILLMAN: -- unearthed some experience I had at TMI 1 on the river water pumphouse in dealing with these long column pumps, years worth of dealing with those when I was involved in that plant.

Why wouldn't you make a command decision today to raise that pump? That's a safety grade pump. Actually that's an NSR QA1 Seismic 1 critical SSC. Why wouldn't you make a command decision to raise that pump above 17.6?

You're never going to be able to seal that pump and the floor openings to assure that that cavity or that cubicle can't flood. And when you might need that pump the most is when you may not have access to that facility to take care of that pump. So it just seems to me that for those who have dealt with that particular type of equipment, those pumps are, they're dependable if they're put together correctly, but the wrong pump, well, actually the pump is at the bottom. So you have a bunch of tubes, a long shaft. You've got supports like a transmission for a bus or a truck. But the motor's vulnerable.

So I'm just curious why you wouldn't simply say, hey, we're going to put that pump and motor above 17.6.

MR. RAO: Actually the motor is at elevation -- oh, well, we don't know for sure exactly where the motor would end up once the whole detail of the pump is established.

MEMBER SKILLMAN: If all of the electrical supply is above 17.6, I think, I know my views are good to go, but if you have the electrical equipment vulnerable for that 17.6, I think you're building in a safety issue that you don't need to build in given the time that you have in advance of construction.

MR. FINLEY: Well, of course we have to pick some elevation. We believe this 17-foot surge level is --

MEMBER SKILLMAN: Not very probable.

MR. FINLEY: -- very conservative. The existing sites have never seen water above the ten foot, as I mentioned. And other sites on the Bay, maximum in the last 100 years, seven foot, something like that.

So we try to balance cost of the structure against the likelihood of these kinds of storms, and the fact that the seal that Shankar talked about that I think that's the critical component, the seal in the floor on this pump is what's key.

We think we can seal that floor. There are other watertight doors that we rely on on this structure, but we also think we can rely on those watertight doors as well. We'll be testing them as required, inspecting them as required. We'll have tech specs on seals and doors. So we think that's acceptable.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay, so anything on precipitation? Let me see, yes, so it's a little more on precipitation, I think on Slide 23. This talks about, essentially, drainage of that worst precipitation down our drainage ditches and alongside a road that comes up from the Bay.

We've looked at this velocity of the water and we're protecting those drainage ditches with concrete or rip-rap to make sure that we can handle that kind of velocity and not have scouring, so that underground piping and structures and stability of the slopes, et cetera, are not affected.

And there's a diagram on Slide 24 that shows that road that I mentioned and then the drainage along the road. And underneath that road or alongside that road is where we do have some pipes, the makeup water pipes that come up from that intake structure on the Bay.

And we'll have protection above those pipes related to this drainage.

MEMBER STETKAR: Makeup water pipes and electricity going down to the intake structure also.

MR. FINLEY: That's correct. That's correct, yes. So that's an important feature. Slide 25. I think I'm coming back to something I commented on briefly before.

So we looked at that Johns Creek which feeds into the St. Leonard Creek. That's on the west side of the plant. Again, we looked at the rainfalls of roughly 18 inches an hour and how that would drain through Johns Creek.

Slide 26 just shows again that worst elevation, that 65 foot, and I think that assumes that the drainage that goes actually underneath the highway to the west of the plant is blocked. And our worst elevation of water on the Johns Creek is 65 foot, and that's well below roughly that 98-foot drainage divide.

If you look on Slide 27, it shows roughly the drainage divide at 98 feet. So there's a lot of margin on the west side of the plant related to drainage of that Johns Creek.

Okay, Slide 28. Potential dam failures I've already touched on, but just to hit them again we've looked at these two dams and reservoirs upstream on the Patuxent River and if they both were to fail we'd see about a two feet increase in the tidal river reach on the St. Leonard Creek and affecting Johns Creek, but that really never makes it around the peninsula to affect the site at all. So the dams, not really a concern.

Slide 29 just shows where those dams, the Brighton Dam and Rocky Gorge Dam are located, well upstream on the Patuxent River. Slide 30, I've already talked about on the hurricane, and 31, so you can skip over those. Slide 32 talks about tsunami. So we've looked at tsunami here. I'm not going to cover all these bullets in the interest of time, but the third bullet down shows the maximum worst case tsunami runup of 11-1/2 feet, so you recall the hurricane. This is of course on the Bay, basically in structures on the Bay. So that's well below that 32.2 foot worst case for the hurricane.

So the hurricane is what sets the design basis for that structure, not the tsunami, with a lot of margin.

MEMBER ARMIJO: What would trigger tsunami for your site?

MR. FINLEY: Yes, what we analyzed was landslides both underwater, and I think partially above water and underwater. I don't know, Shankar may --

MR. RAO: Our colleagues here, Dr. Mustafa Samad can explain a little bit more clearly.

DR. SAMAD: We actually looked at the potential tsunami sources, that's marked here around the site, and we have initially identified five sources and came down to three that were actually, like, impacting the site. And the most important of those was from a landslide off the coast of Virginia, as part of that landslide region.

We also looked at the tsunami coming across that land portion, some of the areas in the regions around the coast. And also we looked at the tsunami that came from the Caribbean. So these are three that we analyzed.

CHAIRMAN POWERS: What does the sediment buildup coming out of the Chesapeake Bay look like?

DR. SAMAD: The sediment impact from the tsunamis particularly, we analyzed and we concluded that, that there's almost no impact on the unit because the tsunami waves that are heading across the ocean coming into that --

CHAIRMAN POWERS: What I'm really interested in is that you have a certain sediment flow and build coming out of the Chesapeake Bay and it builds up a mound someplace. What does it look like? I mean, in the case of the Mississippi River which is the one I know most about, it's huge. I don't know that that's the case for the Chesapeake Bay. I just wondered what it looked like.

MR. FINLEY: You mean the general --

MEMBER STETKAR: The contour under -- yes, the contours at the Chesapeake Bay outlet.

DR. SAMAD: What happens in the Chesapeake Bay is like when you have a large tsunami comes in --

(Crosstalk)

MEMBER STETKAR: No tsunami. If you went today and did a contour map out under the water out from the site through the Bay all the way out to the edge of the continental shelf, what would that look like?

DR. SAMAD: At this time from the site, from the existing site, existing plant at the site which draws water --

MEMBER STETKAR: Sorry. Go to the mouth of the Chesapeake Bay, forget I said the site. What does it look like underwater from there on out? It sort of goes like this but it's got some bumps in it.

DR. SAMAD: Exactly. But there's a deeper section at the mouth and then there's a shallower section right after the mouth, and then it goes into a deeper section again in the Bay and then comes to the site.

And the site has, there is a channel, intake channel that draws water --

(Crosstalk)

MEMBER STETKAR: This is it. If I have a mountain here built up of silt from Chesapeake Bay, where is that relative to the edge of the continental shelf to precipitate a landslide at the mouth of the Chesapeake Bay? Right? Dr. Powers, you got it. Thank you. Got it?

DR. SAMAD: Yes. So let me rephrase the question so that I'm hearing that what I understood is the one you want. One is the variation of bathymetry for the tsunami would come in from the --

MEMBER STETKAR: No, no. No tsunami. Is there a mountain at the mouth of the Chesapeake Bay that can go away and cause a tsunami right there, a tsunami --

DR. SAMAD: At the mouth.

MEMBER STETKAR: -- at, near, I don't know. How close do you want to get, Dr. Powers?

CHAIRMAN POWERS: Close. But close could be defined as 100 miles away.

MEMBER STETKAR: Is there some local feature that is different than just the continental shelf that you looked at in the Virginia/Carolinas region? Is there something local that might give you a larger landslide potential there just because of the existence of the outflow and deposition from Chesapeake Bay?

MR. FINLEY: Understand the question. I'm going to defer to Mustafa.

DR. SAMAD: Yes, our indication is that likely there is no such sources for landslides near the Chesapeake Bay --

MEMBER STETKAR: Why do you know that?

DR. SAMAD: We looked at the geology and formation of the Bay and for the eastern side and western side and mouth at this time. And like, our geological information come through there which is describing in Section 2.51, there is no potential for a subaerine landslide or submarine landslide near the Bay that can cause a tsunami.

MR. FINLEY: Yes, the slopes in the Bay are very gradual, you know, the channel might be 120, 150 feet. And it's --

CHAIRMAN POWERS: That I believe.

MR. FINLEY: But we do have some bluffs along the side of the Bay, but those are 130 feet and small.

CHAIRMAN POWERS: I'm more concerned about the buildup of sediment. It could be clear out to the continental shelf, in fact it probably is. Because at the continental shelf it can fall off and go to --

MR. FINLEY: 2,000 feet.

CHAIRMAN POWERS: -- 5,000.

MR. FINLEY: Right, right.

CHAIRMAN POWERS: Okay, and it's that mound building up that I'm interested in.

MR. FINLEY: Right, and I think that that's, correct me if I'm wrong. That's what they looked at is that kind of a landslide on or near the continental shelf, no?

DR. SAMAD: Yes. The critical slide zone is actually under the continental shelf. It is entirely submarine landslide. And like we looked at it in 2006, but since then there have been new studies done by USGS. We got it from academia. It's a model of important shelf landslide zones out on the continental shelf.

And we took results from one such studies to get the bounding values at the mouth of Chesapeake Bay, what the tsunami looks like inside the Bay. But the main impact source the tsunami getting some so that it have more impact at the site just because of the landslide on the continental shelf.

MR. FINLEY: Right. That's the second bullet on Slide 32 there speaks to the landslide. That is the limiting tsunami scenario.

CHAIRMAN POWERS: Okay, so that's what you're looking at and that's what causes your headache.

MR. FINLEY: That's right. Well, again it's much lower than a hurricane so it's --

CHAIRMAN POWERS: Yes, so it's not much of a headache.

MR. FINLEY: Right.

CHAIRMAN POWERS: Nothing at the Grand Banks influence things? Grand Banks?

DR. SAMAD: Yes, the Grand Banks tsunami is the largest recorded tsunami at the mouth of the Chesapeake Bay. But again that's a landslide, and although it may have some impact to the site but to all information would not be the bounding tsunami high for the site.

CHAIRMAN POWERS: But it all seems like it's in the wrong direction to affect something like --

(Crosstalk)

MR. FINLEY: Right. And then it comes through the narrow mouth of the Bay and dissipates.

CHAIRMAN POWERS: Does whatever it does.

MR. FINLEY: Right. Okay, other questions on tsunami? Okay, Slide 33. So I think we can come back to the question about debris here now. So this talks a little bit about how we've considered the forces and looked at the configuration with respect to debris and erosion effects.

And I think Slide, doesn't Slide 34 talked also about sediments? But I think the best way to look at this problem is to first look at Slide 35. So Slide 35 first. It shows a plan view again of this intake structure and where the intake pipes are.

So you can see for the upper left hand side where the sheet pile wall which is existing now for the Calvert Cliffs 1 and 2 units, and then a baffle wall -- I'm sorry. You can see the baffle wall which is existing. The sheet pile, I think, will be new for us. So that's the area that's protected in terms of debris.

But you can see better or another perspective on Slide 36. So this is a blow-up of that intake area where these intake pipes are. On the left slide it's a plan view. So these intake pipes are about five-foot diameter pipes and they're protected with security bars basically, and also that sheet pile wall that we talked about.

And the elevation view on the right hand side shows that that particular intake area is dredged to about minus 25 foot just inside the sheet pile wall. And then the pipe elevation itself, centerline, is about minus 15 foot. So there's about a ten-foot margin, if you will, with respect to sediment that might be brought in by a storm or over time.

Shankar, maybe you can comment on that?

MR. RAO: And that's why they were set up higher from above the minus 22, which is the bottom of the floor, so any sediment that would collect will not be transmitted back to the intake water pumps.

MR. FINLEY: So as far as major debris like trees and branches and that sort of thing, it's kept out with these bars and the fact that it's a submerged pipe down at about minus 15 feet. And then sediment, we have some margin in terms of the depth of the dredging where those intake pipes are located.

MEMBER ARMIJO: So the only thing that could really get through would be sediment. I mean, wood and debris would be floating way above.

MR. FINLEY: That's correct. Of course you have storms in between, right. You don't always overflood with everything. So you're going to have debris potentially for storms at this level, but those bars will help keep the big pieces out and then there is a configuration into the forebay and then there's some traveling screens before the makeup pumps in the forebay as well. But the big pieces should be kept out by these bars.

MEMBER STETKAR: Actually looked at, the things you worry about more is the large quantities of stuff about this big that gets through the bars, gets through the rakes?

No, they're not rocks. It's gook. And what characterized it is anything other than gook. It tends to be things like leaves and vegetation and stuff.

MR. FINLEY: Jellyfish and --

MEMBER STETKAR: Jelly fish and, you know, parts that get swept in during storms. There's typically more during, for river in sites but could be during a hurricane and things like that. And that can go down to quite a depth also, you know, you get a reasonable amount of turbulence. They tend to plug up traveling screens because that's your last, and it's the analogy of the GSI-191. Plug the fuel --

MEMBER ARMIJO: I don't know how these things are maintained, but this region behind these security bars, are they periodically cleaned out and flushed to get rid of --

MR. RAO: I don't know the exact timing for clean out but yes, maintenance will be conducted.

MR. FINLEY: Yes. Yes. All the pipe on this configuration of the piping. And we do have the ability, I think, to drain the intake pipe and do inspections and maintenance on the pipes themselves. I don't know exactly where the stoplogs would be. I think we would have to use divers outside of the security bars to check the elevation of the sediment. But that's something that will be checked periodically.

MEMBER SKILLMAN: What is the experience of Calvert Cliffs 1 and 2 with regard to intake structure plugging? What I'm thinking about is the experience that Salem and Hope Creek have had, where an artificial inlet in the Bay there.

There is a time in the year when there is a particular outcropping of biological matter that finds its way through. In the case of the condensers, the screens, and it really reduces the thermal efficiency.

MR. FINLEY: Yes. And I was going to mention, Dr. Stetkar mentioned the size. So we have access to the operating experience of the existing units obviously. Bechtel was involved in constructing that unit.

And the details of the design basis for the traveling screens and so forth hasn't been set yet, but we have access again to what's gone on at Calvert Cliffs 1 and 2. And the main issue there has been two things. One, jelly fish, and secondly, fish kills due to oxygen issues in the Bay, overloading the traveling screens. So we have that again.

And they've addressed that through modifications to their traveling screens, the speed of the traveling screen and the screen wash flow, et cetera. So we'll have all that as design input for our traveling screens. But that's the main challenge. Grass has not been an issue for Calvert Cliffs as it has at Salem.

MEMBER SKILLMAN: Power supplies for traveling screens and mechanical components for traveling screens, are those nuclear safety related?

MR. FINLEY: Actually we'll talk about that this afternoon in Chapter 9, but they are safety related.

MEMBER SKILLMAN: Fair enough. Thank you.

MR. FINLEY: Okay, I think I'm on 37. We're going to shift to ice unless there's more questions about debris and storms. Okay, so ice essentially, again drawing on experience from the existing units. They don't have a frazil ice problem. We have seen some ice on the Bay. We predict maximum ice thickness of 13 inches, and we have the kind of depths as we just saw in the previous diagram, minus 15 foot roughly for the intake pipe that we should not have a problem with ice affecting the intake.

We calculate a design low water level of minus 7.7 feet and that's not going to affect our intake piping or intake structure. And 38 continues with some ice effects. We don't expect any real flooding to be caused by ice on the Chesapeake Bay. It's just not something that happens on the Chesapeake Bay, therefore that shouldn't affect --

CHAIRMAN POWERS: Do you run into problems of, not ice forming on the Bay, but ice forming on the streams coming in, breaking loose and then you've got a bunch of ice cubes, for want of a better term, coming down the Bay and then collecting around the structures and what not?

MR. FINLEY: Again, from the operating units Calvert 1 and 2, no difficulty with that or experience with that during its operating lifetime. I don't know if -- Shankar, do you have any data or background on that?

MR. RAO: I think all the ice history was considered and we established the 13-inch. The maximum ice that was recorded was five or six inches near the Bay.

CHAIRMAN POWERS: You don't have any major tributaries below those dams?

MR. FINLEY: No. Of course you have the Patuxent River, but the Patuxent River is tidal where the site is.

CHAIRMAN POWERS: Right, I don't think that one can, so there has to be something more like your streams coming in.

MR. FINLEY: Right. Those are small.

CHAIRMAN POWERS: Everything's small. There's nothing big.

MR. FINLEY: No. No big rivers near the site. No. Okay, I think I'm on Slide 39. And this is, again we have no canals or reservoirs that are part of the design for Calvert Cliffs, so no concern in terms of --

CHAIRMAN POWERS: Actually from these kinds of perspective this is an awfully nice site.

MR. FINLEY: We think so too. We have a source of water but it's relatively, it's not an ocean.

CHAIRMAN POWERS: It's a nice source of water.

MR. FINLEY: We agree. Slide 40. This is speaking about diversions of sources of cooling water. But again I think we've talked enough about the physical configuration. We don't expect to have diversions of the Chesapeake Bay obviously. We've stabilized those slopes and will prevent any changes in the physical structure. There are no other canals or reservoirs that would be relied on.

Slide 41. With respect to low water we have looked at one other year low water level data. We looked at the Annapolis station. That lowest level was minus four feet roughly. But we calculate minus 7.7 feet as the lowest low water level.

I think that's a drawdown from the hurricane or tsunami. I don't know which one, one of those two. But that's above what our design low water level is, minus eight feet. And the centerline as I talked about before, the centerline of those intake pipes is down at minus 15 feet, and the makeup pumps, I think, use as you see here, minus 11 feet roughly. So we have margin to, I will say that there is some pressure drop or water level head loss through those intake pipes of two or three feet, so we have to design that into the low level design point for the makeup pumps and that's been done.

CHAIRMAN POWERS: Suppose, despite all this, you did drop below this minimum level for your pumps. What would happen?

MR. FINLEY: I'm going to defer to -- well, first, let me set the stage here first. So this is not going to cause a plant transient in the sense that unless you're going to lose offsite power you wouldn't need these pumps for operation, just that background, and maybe, Shankar, you can tell me the effects of low water level on the makeup pumps.

MR. RAO: You have some margins in the tech spec limits here, pumps, operating margins. However, the typically design basis events along with all this happening within the 72 hours for which we have the capacity without any makeup for the ultimate heat sink cooling powers would have to be looked probably from that perspective. And that's all I can probably point out to that from the design perspective.

CHAIRMAN POWERS: If we cast the scene this way that we've had some event like loss of offsite power or something like that, we're using this after 72 hours to make up, and then we have some transient event that drops down below our expected level, you shut the pumps down, right?

MR. FINLEY: Yes. At some point these pumps are not going to pump water so you would shut them down, yes.

CHAIRMAN POWERS: And sooner or later nature's going to take its course and the water level is going to come back up.

MR. FINLEY: Right.

CHAIRMAN POWERS: But again, I don't have any --

MR. FINLEY: Doctor, you're into the, you know, Fukushima type analyses of loss of ultimate heat sink and loss of all AC.

CHAIRMAN POWERS: You're right.

MR. FINLEY: So we would have other temporary equipment that we would rely on, portable equipment that we would rely on.

CHAIRMAN POWERS: I mean, it seems to me it would just shut the pumps down, because you've been feeding water in and maybe haven't got as much as you want, but you've got a few hours and eventually nature has to take its course. I mean, I can't come up with a scenario that permanently drops the water down eight feet.

MR. FINLEY: Right. That's a good point. I think these are all, both the hurricane and any drawdown or surge situation is a temporary situation. And we do have that 72-hour cushion such that if the event were to occur at the time of the hurricane or tsunami, seismic event, we really don't need additional water for 72 hours. So there is some time to react.

CHAIRMAN POWERS: Yes, I mean, I just don't see anything. I mean, one can hypothesize that exactly when you need --

MR. FINLEY: Right.

CHAIRMAN POWERS: -- to supply water, but then you're getting off into probability, negligible kinds of events. And again it's, okay, wait 15 minutes. I mean --

MR. FINLEY: Right. They should be transient situations.

CHAIRMAN POWERS: Yes, it has to be a transient situation. Or if it's a nontransient situation it's probably occurred so long that you realize --

(Crosstalk)

CHAIRMAN POWERS: Yes, you repeat structure or something like that.

MR. FINLEY: Right. I think we're on Slide 42 now. Now we're coming back to the question about the buildings and how they're protected from ground water, I think, and we can try to answer the question about those components that are under ground level.

So ground water, we do have obviously ground water at Calvert Cliffs, and we've talked before about the caustic pH associated with our ground water. Roughly 5.2 pH. So we have to take some corrective measures, but that doesn't affect by the way the structure on the Bay.

We don't have that low pH situation in that water around the structure on the Bay, but we are going to address any issues with brackish water based on the recipe we used for the concrete that's 5,000 per square inch strength. Concrete should address the brackish water issues we have.

With respect to the pH issue, on Slide 43 we're going to have a geomembrane around the safety structures. We'll have a groundwater removal system and a monitoring system within that membrane. I'll show you a diagram of that in a second. We will have a monitoring program during construction and just after initial operation to monitor that ground water and dewater is necessary.

If you look at Slide 44, for structures that are into that groundwater table. So that the highest groundwater table elevation is calculated to be of 55 feet as you see there on Slide 44. And we will have this geomembrane, which is waterproof, up to above that elevation.

And I think there was a question at the last meeting earlier in the spring about infiltration of rainwater through the soil from up above. One thing we didn't answer at the time was that this geomembrane is essentially capped off to prevent that kind of infiltration from rainwater up above, so we shouldn't get rainwater within that membrane.

And as I said, we'll be dewatering within the membrane and monitoring. So we'll be able to keep the caustic groundwater away from the safety structures is the bottom line. Now we have some structures --

MEMBER ARMIJO: But you'll also know that it's leaking, right?

MR. FINLEY: We'll know if it's leaking. That's correct. So we'll be monitoring any water that gets within the membrane and we'll be able to pump, dewater it as necessary to prevent the water from reaching the structure.

Now for the next slide, Slide 45 shows we do have safety structures obviously that are above the water table. Now a little different protection for these. We call it a dampproofing system. But still we'll have some coating on the structure itself to keep the ground moisture away from the safety structure. So we feel we have a pretty robust waterproofing and dampproofing system to keep water out of the structures.

So let me come back now to the question about safety components below grade. So I'm not sure what additional information we can give, but we'll keep water out of the structures, away from the surface of the structure.

We've calculated the surface flooding

condition to keep that level below the entrance of the structure, and there are underground pipes that pass through these structure walls that those will be sealed and monitored. I'm not sure what else --

MR. RAO: And we do have internal flooding protection mechanisms.

MEMBER SKILLMAN: I think you've answered the main target of my question. Where I would go from here is your PRA for internal flooding to find out what protections you have to ensure that the SSCs that are required can perform their duty.

MR. FINLEY: Okay. And we relied primarily with respect to PRA for internal flooding, we relied primarily on the design certification PRA that was done. We really don't have any differences than what's in the U.S. EPR FSAR.

And just an important concept there as for the safety structures, we do have four divisions and all independent in terms of flooding, right, all separated by structure --

MEMBER SKILLMAN: Physical barriers.

MR. FINLEY: Physical barriers, yes.

MEMBER SKILLMAN: Thank you. Thank you.

MEMBER ARMIJO: I don't know anything about these textured membranes, so could you fill me in a little bit about the experience that you have as far as time dependent degradation or how thick are they, how much experience has there been with these things?

MR. FINLEY: Yes. I'm going to defer to Shankar. We had a question before. Do you want me to get that one sample?

(Crosstalk)

MR. FINLEY: I'm not sure how it's going to enter the transcript, but I can give you --

MEMBER STETKAR: We did talk a bit about it on the other meeting.

CHAIRMAN POWERS: This committee covers all types of ground. We're on the ball.

MR. FINLEY: So it's a high density polyethylene material and we have test data in terms of the design life of the material. It will be underground. It's not going to be subject to ultraviolet.

MEMBER ARMIJO: Is this actually sprayed on or do you actually roll out a membrane and lay it up against the wall?

MR. RAO: These are sheets, sheets that will be put down below, right over the bottom part and then on top of it you will have the foundation. And then on the side you have, if you look at the picture on 44, we do have a secondary membrane which is liquid applied, or it could be this edged Epe. It will be attached by some kind of adhesive device on it so that --

MR. FINLEY: And of course inspected as you construct --

MEMBER SKILLMAN: Sam, if you become a point where the building is so sealed it's potentially buoyant, I'm serious.

(Crosstalk)

MR. RAO: And that is considered in the design of the forces for coming out of the building from that angle. And that's why --

MEMBER ARMIJO: You assume that's actually hermetically sealed. That there's nothing coming through.

MR. RAO: So the structure is more foundation depth you need.

CHAIRMAN POWERS: I'm running a test for you guys on a very similar material, and so far after three years it's performing marvelously.

(Crosstalk)

CHAIRMAN POWERS: It's not biodegradable. Actually I'm using it as a biobarrier rather than a water barrier. Water's not a big issue into Mexico as far as having too much.

MEMBER SKILLMAN: Isn't that why there's a bag tax in Maryland?

MEMBER ARMIJO: On your buried pipe, it's protected by wrapping. I'm assuming it's carbon steel of some sort. Do you also have a cathodic protection system?

MR. FINLEY: Yes, we do. So buried pipe, we do have some carbon steel buried pipe. Those intake pipes are made of carbon steel and they're either coated or wrapped and they have cathodic protection. The makeup piping from the makeup structure up to the power block is actually austenitic stainless steel. So we have carbon steel, we have austenitic stainless steel.

MEMBER ARMIJO: And some sort of transition piece between those?

MR. RAO: No, they're independent. The main inlet pipe terminates at the inlet forebay as we call it. And then the pipes that are from the pumps up to the cooling towers, they are a separate piece of pipe.

MEMBER ARMIJO: Okay, thank you.

MR. FINLEY: Okay, I think we're getting close here. The last piece is liquid effluents. And if you go to Slide 46, we talk a little bit. We've looked at the different pathways, if you will, for groundwater and use the source terms that we get from AREVA and the U.S. EPR FSAR, assume some leakage of tanks. And calculated the dose, essentially, due to these different sources.

On Slide 46 you see the highest of those doses is about 74 millirem per year. A diagram of the different pathways analyzed is on Slide 47. Shows where the groundwater has been analyzed to flow. Don't know if there's any specific questions of that, but we've done that of course in accordance with the approved methods.

Slide 48 just speaks to the fact --

CHAIRMAN POWERS: Do you calculate these doses based on the source terms, do you focus just on dissolved radionuclides? Do you consider colloidal transport?

MR. FINLEY: So this is liquid. The source is liquid rad waste, so it's liquid rad waste tanks, you know, in the safety structures that are assumed then to leak. I don't know. And I don't know if we have the right people here to answer the question about colloidal materials.

Shankar, do you want to --

MR. RAO: I wouldn't know that part but we can take that as a --

CHAIRMAN POWERS: It's one I can tolerate a later input.

MR. FINLEY: Okay. Well, we'll have to

follow up on that question. I don't know. Okay, and Slide 48 just speaks here about surface releases. We don't expect to have any spills, if you will, that are released on the surface. Tanks that are well surrounded by structures so that should not be a problem.

Slide 49 speaks more about piping and heat exchangers. Again we have four divisions of separate safety structures, Safeguards Buildings 1, 2, 3 and 4 that house these components. They're all physically separated to keep the flooding effects independent of one another.

We don't have any outdoor tanks. They're all within these structures. So we don't see a surface pathway, basically, for flooding from equipment.

And Slide 50, we have not in any of our discussions here relied on emergency operations, procedural operator type actions to respond to these flooding scenarios, so we don't have requirements for tech specs or procedures that relate to that, essentially that the physical design of the structures will give us what we need. So I think that's it. Hopefully I didn't go over too much on the time.

Just to summarize, Slide 52, again we have no departures or exemptions, no contentions. We've talked about all of the COL items there. And I think the staff, next, will talk about the confirmatory item and two open items that we have that they're still reviewing.

Paul?

MR. INFANGER: We looked at some of the information, some of the questions that the ACRS had. Do you want to go over those now?

CHAIRMAN POWERS: Do we have them readily available?

MEMBER STETKAR: I have one more question.

MR. FINLEY: One second, Paul.

MEMBER STETKAR: You went through it pretty quickly. I was thinking about structures and things like that. I know where pretty much everything is on the site. One thing I was thinking about, and I didn't see it addressed, is the essential service water basins.

And I don't have precise information. I think I know things, but correct me if I'm wrong. I believe the normal water level in those basins is about 8'9" above grade. Is that correct? In other words, they're a mostly below ground but partly above ground swimming pool.

And if I did, this is rough because I have to sort of interpolate information from various sources. But as best as I can tell, above grade level they contain about 10,000, or 15,000 or 20,000 gallons of water above grade. Did you look at flooding from those? Because they're the same grade elevation as the diesel generator buildings. I know they're the same grade elevation as the diesel generator buildings. They're slightly below grade from the rest of the main power block. Did you look at flooding from that?

MR. FINLEY: I'm going to ask Shankar if he knows. I'm not aware.

MR. RAO: These are safety related seismic Category 1s.

MEMBER STETKAR: I understand that, but you're looking at flooding sources that have much lower frequencies than events that might cause failure of these, so you've not introduced frequency in any notion into your flooding analysis.

Frequency of the tsunamis that you've evaluated or even the storm surges might be lower than the frequencies of flooding of these things. I was just curious whether you looked at them, because there was a statement made that there aren't any above ground tanks or structures that contribute to flooding.

And there was, I mean, you looked at the big cooling tower. You looked at the desalination plant and its tanks, and they're all down grade from everything.

MR. FINLEY: Right, right. So I would just clarify. So yes, tanks aren't outdoors. You're right. The structure itself is a tank, if you will, underneath the cooling tower. So I don't know if we postulated failure of that structure on flooding.

MR. RANDALL: No, but there's a pipe break outside the wall because the pipes come in underground. And there's a scour analysis of what happens to that --

MEMBER STETKAR: I looked at that Bob. But that's if the plastic pipe coming in breaks.

MR. RANDALL: Yes, but the water's going to come from both directions and then it scours away and comes to the surface --

MEMBER STETKAR: Oh okay, so that's a good point. Yes.

MR. FINLEY: And I know, and Shankar, correct me if I'm wrong, we have sort of a limiting internal flooding scenario that relates to the main circ water flow and main circ water pumps. And essentially we show that it could fill up --

MEMBER STETKAR: That's internal flooding though.

MR. FINLEY: Right. Fill up the turbine building and then spill out at some flow rate --

MEMBER STETKAR: I'm mostly interested in the closest, and if I look at the, I don't want to telegraph what I'm interested in too much because I don't know enough about hydrology. I know that the ESWS basins aren't at the same grade as the diesels, right? And I know that they're slightly below grade, nominal grade for the safeguards buildings, maybe a foot or foot and a half. And that I know that the ESWS or UHS division two is closest to the nuclear island.

So in terms of lateral proximity, you know, that's the one that would have the closest chance of actually, you know, having some water elevation. I was just curious whether you looked at it.

MR. FINLEY: Okay, so I think we're going to have to take an action, Dr. Stetkar. I don't --

MEMBER STETKAR: I mean, you know, if you took that 800 and 1,000 or how ever many gallons it is and immediately released it on the ground and could show that it all goes away where it's supposed to go away that's fine. It couldn't get any worse than that.

MR. FINLEY: In terms of the methodology I know we consider pipe ruptures. I don't know if we considered structure.

MEMBER STETKAR: I looked at the, because especially of the nonseismic normal makeup pipes, you certainly looked at those. And I know that water can't get in the building. I know the water goes up and out.

I don't think the water coming back in would --

MR. FINLEY: Okay, so we'll take an action on that question. I'm going to suggest, Dr. Powers it's up to you, that we take a break. I need a biological break for one. And then come back to the slide that I think maybe would answer the question about aquifers, or is that the one you have, Paul?

MR. INFANGER: A couple of them.

MR. FINLEY: Okay. So we can --

CHAIRMAN POWERS: And then Mike, we're going to delay your staff's presentation for a few minutes to cover those when we come back from a break. We are taking a break until 25 of the hour.

(Whereupon, the foregoing matter went off the record at 10:18 a.m. and went back on the record at 10:35 a.m.)

CHAIRMAN POWERS: We will come back into session, and Mark Finley is going to try to answer a couple of questions that arose in the previous discussion. Mark, the floor is yours.

MR. FINLEY: Thank you Doctor. So I want to introduce Paul Infanger. He's my licensing manager. Been with UniStar several years. You can give yourself a better introduction.

MR. INFANGER: Yes. Been with the project since 2008, and prior to that I was licensing manager at several operating plants. I have a masters in nuclear engineering from Ohio State University, and working with UniStar for about five and a half years.

CHAIRMAN POWERS: Sometime you're going to have to explain to me why they call it The Ohio State University.

MR. INFANGER: Yes. I know sometimes I have to look under T when I'm looking for something. What we did, we looked up a couple things. There was one question about what was the effect of Hurricane Sandy, a very large storm that happened just last fall.

And we did find an article that was in the local paper where they talked about, you know, it showed a measure of mercy at Calvert County so that sounds good already, and I lost it. Okay, and it says that there, you know, dodged the bullet remarkably well, but this is the key statement here.

"Despite concerns that high waters from storm surges could wreak havoc on operations, Calvert Cliffs nuclear plant in Lusby also came through Sandy with no reported problems." So the plant came through with no reported problems. "We did some preparations beforehand, said Constellation Energy Nuclear Group spokesman Kory Raftrey, who added both of the plant's reactors were on-line the entire time."

So the storm did not cause the plant any type of --

CHAIRMAN POWERS: Trust, sir, we would have known about it if you had a problem.

MEMBER STETKAR: I would have been able to find that.

MR. INFANGER: So I think we can say that the storm did not cause any undue problems.

CHAIRMAN POWERS: And the question is --

MEMBER STETKAR: That's anecdotal experience we're going --

CHAIR MARKS: Well, the question is, could a small perturbation of that storm have been more horrific? I mean I think you've covered that.

MR. FINLEY: I probably have.

MEMBER STETKAR: The larger question I had though is in the FSAR you have a table that lists up through 2003 or whenever you did your cutoff date, certainly before October of last year, the highest recorded historical water levels, these are at Baltimore and Annapolis, apparently, where they had gauges, and I was curious whether or not Sandy would have made this list.

In other words, the Baltimore and

Annapolis, the smallest value on this table is 4.3 feet at Baltimore, Hurricane Hazel, and Hurricane Fran for Annapolis, 3.48 feet. So I was curious whether Sandy resulted in anything worse than --

MR. FINLEY: Yes, well, I know it wasn't worse. So the 2003 storm, it's high on the list there both in Baltimore and Annapolis, and there was not flooding like that from Sandy in either one of those city locations. Whether it would have made the list --

MEMBER STETKAR: See, I did find from Annapolis, for example, it showed flooding in the streets in Annapolis from Sandy. And in fact, there was a storm later in the year, in December of last year that they said the flooding was worse than Sandy but it was a local.

MR. FINLEY: So I think there might have been some --

MEMBER STETKAR: But I was just curious where it was on this list, you know, because it was a notable event.

MR. FINLEY: But I think what's more important maybe comes to Dr. Powers' question. So Sandy was similar to the storm we analyzed in the sense that was moving from east to west, which is the worst for storm surge on the coast. And we postulated a storm moving east to west at the mouth of the Chesapeake Bay with the worst winds causing the worst surge right at the mouth of the Chesapeake Bay.

MEMBER STETKAR: I'm not arguing with you.

MR. FINLEY: I'm confident that we bound Sandy in terms of both the strength of the storm and the direction, you know, the track of the storm. Whether or not it would it make --

MEMBER STETKAR: I'm not disagreeing with that.

MR. FINLEY: Okay. What was the other -- oh. Okay, so the question about aquifers, and this is a document actually Bechtel did for us. They studied use of ground water for the purpose of construction time frame.

And so you see some different aquifers on here. Calvert Cliffs 1 and 2 are in that Aquia aquifer for their wells. We have done some analysis of drawing that 70 gpm for construction support also from that Aquia aquifer. However, we know that deeper aquifers are available.

So if our testing of wells that we would dig to support the construction process don't show the right flow rate or there are any concerns about drawdown, we can go deeper to deeper aquifers and those would actually provide a greater flow rate and less concern about drawdown.

So the Aquia aquifer, I think, is the answer to the question that was asked about where we would draw. That's about 600-700 feet deep. Okay, is that it Paul?

MR. INFANGER: Yes.

MR. FINLEY: Okay, I think that's all we had. So I think we still have an action relative to the rupture of the basin and how that affects flooding, whether that was considered. We have some other notes, perhaps some other action items as well.

Good, that was all I had. If there's no other questions I'll stop speaking.

CHAIRMAN POWERS: I'm staying reasonably on schedule despite our somewhat nonlinear progression through the material.

MR. FINLEY: Okay, thank you.

CHAIRMAN POWERS: Mike, you're up.

MR. TAKACS: All right.

CHAIRMAN POWERS: Okay, we're going to have the line -- Mike, you've got at least one person on this team that I don't know.

(Crosstalk)

MR. TAKACS: Okay, good morning again, Dr. Powers and committee members. I'm Mike Takacs. I'm the acting lead project manager for the Calvert Cliffs review. We're here to present the Section 2.4 of the safety evaluation with open items.

One thing I just want to clarify, in the Calvert presentation they mentioned two open items and one confirmatory. We have a third open item which is just a general EPR DC open item in our presentation. So you'll see that in there.

It's in every section of course of the SE's 19 chapters. As I mentioned I'm the acting. Phyllis Clark is the Chapter PM, she's situated over in the left of the room there. And with me I have several --

CHAIRMAN POWERS: You can take Lee's place. They wouldn't lose much there. I know no mercy, right?

MR. LEE: Not for the weak of heart.

MR. TAKACS: With me I have Mike Lee, Henry Jones, Lyle Hibler and Philip Meyer. And we have a fifth tech reviewer, his name is Rajiv Prasad, on the telecon, I believe. If he has a question can he speak, or is it listen only?

MS. WEAVER: I'm going to open the line. Just let me know.

MR. TAKACS: Okay, very good. And with that, Dr. Powers and committee members, I'm going to turn it over to, I believe, Mike Lee. Are you going to present the presentation?

MR. LEE: Right. Thank you. Okay, so I think right now we're showing Slide 2. And Mike has kind of gone through. There is a number of staff both here and at remote locations that have supported this review. On Slide 3, of course you see my name as well as Henry Jones, Lyle and Philip from PNNL. So we'll be doing the speaking and be prepared to respond to any questions that the subcommittee might have.

If you turn to Slide 4, this is just a summary of where we are right now, and Mike just basically just spoke to this slide. So if we turn to Slide 5, the items that we're currently tracking, specifically Slide 6 is, as Mike's pointed out already, that there's that one existing RAI that's associated with the final safety evaluation report which we're tracking administratively.

And once that open item is closed and the FSAR is finalized then we're going to come back to this chapter and make sure that there's no loose ends.

Slide 7. The one RAI that we are currently tracking as a confirmatory item concerns some typos that we found in Chapter 2.4 regarding some numbers. We found a few inconsistencies. We're going to go ahead and we've got a commitment from the licensee that in the next iteration of the FSAR those typos will be corrected. So we're treating this right now as just a confirmatory item.

Slide 8 are new open items. And then turn to Slide 9, the staff's most recent review found an anomaly in some of the, if you will, the illustrations that were depicting the footprint of the Calvert site, and we've asked that in the next iteration of the FSAR that we get that footprint depicted consistently.

Turning to Slide 10, we have an open item concerning subsidence -- I'm sorry. I picked it up ahead of myself. I'm sorry. Okay, I'm done. What I'd like to do now is turn the presentation over to Lyle Hibler and Phil Meyer and they can speak to the current open items. My apologies.

MR. HIBLER: I appreciate the fact that you went over my slide. I was involved in the technical review for the groundwater so I'm just going to talk about this open item just briefly.

In one of the RAIs we asked about groundwater use. and the applicant responded in that with an analysis for subsidence based on drawdown for construction water use, and that construction use of water their rate of use is estimated to be 288,000 gallons per day for six years.

So they calculated drawdown and then

estimated the rate of subsidence, based on that maximum drawdown amount calculated total subsidence at the site and gave us a bounding estimate which we reviewed and agreed with.

Subsequently, the COL FSAR was updated and stated that groundwater use that had not previously been identified was included. That it was mentioned this morning that when the desalination plant's out of service groundwater would be used at a rate of about 900 gallons per minute for a period of up to ten weeks. And this was a new use and that's about all the information that was provided.

But if you look at 900 gallons per minute and assume that it's pumped continuously, that's about 1.3 million gallons per day which is greater than the analyzed construction water use. So the essence of the RAIs is that we want to verify that the estimate of drawdown and subsidence documented in the previous RAI response remains bounding given this new operational use of groundwater.

So specifically in that RAI we request information on the anticipated frequency of which the desalination plant will be out of service and require a backup water supply, and identification of the bounding pumping scenario considering that the water source -- you saw a previous slide.

There's multiple aquifers and we haven't been told where that water is going to come from, and that would add implications for drawdown and potential subsidence at the site, and then any evaluation of the effects of any associated long term site surface deformation resulting from that subsidence.

MEMBER SKILLMAN: What is the absolute amount of estimated subsidence or the rate of subsidence, please.

MR. HIBLER: The bounding estimate that is consistent with the information that we were able to find is 3.7 millimeters per meter of drawdown.

MEMBER SKILLMAN: 3.7 millimeters.

MR. HIBLER: 3.7 millimeters of subsidence per meter of groundwater at drawdown.

MEMBER SKILLMAN: Of ground water reduction. Thank you.

MR. HIBLER: Yes.

CHAIRMAN POWERS: Okay, well, I'm a little puzzled. This is unit problem that requires you specifying the area. Are you doing that over one square mile or --

MR. HIBLER: A unit problem? You mean the 3.7?

CHAIRMAN POWERS: Yes, the subsidence per meter of drawdown.

MR. HIBLER: Right.

CHAIRMAN POWERS: But I have data in gallons per minute, so I've got an area --

MR. HIBLER: Right.

(Crosstalk)

MR. HIBLER: What the applicant uses as a model to convert, you pump from a well, you draw the head down and that's, you know, a model that's used to determine how much drawdown there will be at that location and how it changes as you go out from the location of the pumping.

MEMBER SKILLMAN: So this isn't like an Indiana Jones movie where if you pump long enough things just drop into this crevasse?

MR. HIBLER: Well, it depends. You're taking water that's either confined out of the system so you're reducing the head, but the system stays saturated. So the flow of water responds to the changes in the heads. And you're not saturating the Aquia aquifer or other any other aquifer by pumping it.

But the conversion is from drawdown. You go from gallons per minute or gallons per day of water use to drawdown the modeling and then you apply the 3.7

millimeters per meter of drawdown to get the total subsidence, the bounding estimate of subsidence for the location.

MEMBER SKILLMAN: And what is that total?

MR. HIBLER: The total for the construction use was -- I have to look it up. It was a few inches. So at issue, and as I explained it, is that the potential drawdown from the higher use when the desalination plant is out of service could lead to more drawdown. That has not been looked at. But we're just asking for that to be analyzed.

MEMBER ARMIJO: These aquifers don't recharge?

MR. HIBLER: Yes, they do. Primarily --

MEMBER ARMIJO: So is this the net? You know, the recharge rate, I'd assume, is pretty slow compared to the drawdown rate, but I don't know anything --

MR. HIBLER: Yes. In the coastal plain aquifers they're kind of sloped from the fall line. They slope down towards the ocean. And the major recharge area for the deeper aquifers are the upland areas where they outcrop at the surface, and then the water flows, you know, recharges there and then flows down towards the ocean.

CHAIRMAN POWERS: So what you need from them is what the drawdown is at the higher pumping rate.

MR. HIBLER: Yes. And also some identification of where they're going to get the water.

CHAIRMAN POWERS: Water, okay. And they probably can't answer you right now.

MR. HIBLER: There is an RAI.

CHAIRMAN POWERS: Yes, I understand. Can I ask -- no, wait. First, are there any other questions on this matter?

MEMBER SKILLMAN: I'm having a little flash. It goes back to John's question about cooling tower basins and this pump down, and I'm seeing this cooling tower go. Is that what we should be thinking about here? That the ground becomes sufficiently unstable due to the subsidence that the structures that have been designed are now somehow vulnerable?

MR. HIBLER: That's the potential issue, yes. And that was addressed for the amount of subsidence due to the construction pumping. That was addressed by the applicant. So the geotechnical analysis has given a certain amount of subsidence, are we stable, are the structures stable?

MR. FINLEY: If I could interject. Mark Finley, UniStar, again. So we haven't answered this question yet and we're responding to that now. I just want to reiterate that this is a nonsafety related use of groundwater that we'll make sure it doesn't affect the subsidence and the settlement of the safety structures.

CHAIRMAN POWERS: What I understood from you is that from your presentation, Mark, and it may be inaccurate, was that if your finished well coming out of the Aquia aquifer is found to be for some reason inadequate, that you had alternatives that were deeper and thus less impactful.

MR. FINLEY: That's correct. And we haven't finished the analysis, but we do have options. And the options would include not allowing ourselves to draw for ten weeks as was stated. We have a conservative assumption to bring the desal plant back in service in ten weeks.

CHAIRMAN POWERS: I understand.

MR. FINLEY: Again that's a nonsafety function. We can restrict that duration. We can also use other aquifers. We just haven't done the work yet.

CHAIRMAN POWERS: Yes, and so stay tuned, you'll have an answer for that.

MEMBER SKILLMAN: Thanks.

CHAIRMAN POWERS: I think I understand.

MEMBER STETKAR: Now, I have a question

actually.

MR. HIBLER: Sure.

MEMBER STETKAR: Back to hurricanes. I'm not going to let this drop necessarily. Did the staff look at the guidance in Reg Guide 1221 and the hurricane estimates in NUREG CR7005 with respect to the parameters that are used for the what's called the probable maximum hurricane for the storm surge analyses?

And in particular, I haven't done a lot of homework on this and it's not my field of expertise, but I can look at tables. In that NUREG depending on the latitude and longitude, there are estimates of 10 to the minus 6 and 10 to the minus 7 exceedance frequency wind speeds that are on the order of a couple hundred, like 200, not 150, 200 hundred miles per hour.

So the question is, is the probable maximum hurricane that is used for their surge analyses indeed supported by current methods for evaluating wind speeds?

(Crosstalk)

MEMBER STETKAR: Stylized probable maximum hurricane.

MR. JONES: There are two different issues. The one that they use in the guide you're talking about is for wind speeds on the structures. That's different than the hurricane that would produce the maximum surge at the site.

One is meteorological, and you can picture it. You could have ridges, topography, and what I think we did in that, he drove different storms in to try to get the maximum winds on the structure.

MEMBER STETKAR: I understand that.

MR. JONES: And then in our case with the storm surge, you try to get the hurricane that will bring you the maximum storm surge. They're not the same.

MEMBER STETKAR: Okay.

MR. JONES: And I knew this question would come up when I got here --

(Crosstalk)

MR. JONES: And I knew it would come up. And that is a big difference. It's a big difference. For example, like the applicant said, to get the maximum surge you need to have the winds coming out of the south. They're driving up the Bay pushing the water up.

But that's not necessarily will be the maximum winds that you would have in on the structures, that scenario. And so they're totally different. And he came up with probabilities of exceedance which we're now under the new ISG trying to do for storm surge as far as the storm surge --

MEMBER STETKAR: And that's essentially

the genesis because we're licensing this plant as we're going --

MR. JONES: But we don't have the recurrence probabilities for the actual probable maximum storm surge, whereas they're doing it for the maximum wind --

MEMBER STETKAR: You know, I know the reason for that or this particular analysis. Because this is not my field of expertise, I don't have a decent sense of how those two different wind speeds, when they call them that, or two different purposes correlate with one other, in other words, whether there's a direct correlation.

MR. JONES: You have to think kind of in two different, met and ocean space. In the met space you're talking about topographical features that can block your winds, how can the wind get to the site, what direction will it come from. And in oceanographic you have to look at how much fetch in the direction of wind coming over the water line.

MEMBER STETKAR: On the other hand, in principle we're developing information from the same basic dataset of storms, right?

MR. JONES: It's likely you've been around these --

(Crosstalk)

MR. JONES: You can run all these synthetic storms at the site except when they did it for the maximum winds on the structure, you're looking for a different thing. And then when you're doing it for the storm surge, like you said, you've got Sandy which was going off the coast. And what you found there, most of the winds were coming out of the north going offshore into the low lull. So actually you were getting, and I was looking at this myself when it was happening, actually were getting a drawdown.

MEMBER STETKAR: Did you actually get a drawdown?

MR. JONES: It actually was unheard of. It was in the papers. Actually it was getting lower on the Chesapeake because --

MEMBER STETKAR: The upper reaches anyway.

MR. JONES: Yes, those upper reaches. Now if you go up to the Great Lakes where I have to deal with an application there, it was actually driving storm surge down towards our nuclear sites because --

(Crosstalk)

MR. JONES: It was a different scenario. But in this case it was driving things away from the site. So Isabel was a case where it actually mirrored the scenario that they have here, where it was coming across, came on land and was moving so that the winds were coming up from the south.

And so you got about six to nine feet. You flooded Annapolis, you flooded downtown Baltimore. But you only have to have that type of scenario. Only in that scenario you could have a huge hurricane off the coast and you still won't flood unless you have that direction, that precise direction.

MEMBER STETKAR: Henry, you mentioned the staff is working on a Reg Guide or something like that for probable maximum --

MR. JONES: Well, we advise but you review, which we went over the case of the different probabilistic methods of how to do storm surge. We actually have one applicant who has actually come in with a probabilistic storm surge analysis using our ISG.

And I expect there's going to be some more, because what they're finding is if you do it deterministically a lot of times you really get very high storm surges, but if you come in probabilistically you can probably bound it.

The only pressure we have now is did we use 10 to the 6, how do we justify that? We just haven't come up with a reasoning of where do we cut it off for probabilistically. But it's being done as we speak.

MEMBER STETKAR: Okay, thank you. Sorry.

Dr. Powers?

CHAIRMAN POWERS: No. Don't be apologetic because I think it leads in just exactly. My own curiosity has nothing to do with this review. I mean, make that very clear. Nothing I'm asking now has anything -- how are we handling the time dependence of hurricane activity on the Atlantic coast?

MR. JONES: Time dependence?

CHAIRMAN POWERS: Yes. I mean we're talking about building plants, 60 years, okay.

MR. JONES: Yes, definitely.

CHAIRMAN POWERS: Okay, if I go back and look at the last 60 years, that hurricane frequency and the intensity of hurricanes we've had in the last 60 years is not going to be the same as for the next 60 years. And in fact, they may have an inverse relationship. I mean we're going through cycles and if we're down on the cycle there or up on the cycle here and vice versa, what do we do about that?

MR. JONES: Well, that's what we addressed in the ISG. That's why we're trying to go to probabilistic, the JPM method was that you use the current database that NOAA has. You're not relying on something that was fixed in a time. That you go right to the current database that accounts for all the storms, run these synthetic storms based on what you have, and then you're able to assess it.

CHAIRMAN POWERS: Okay, so I build my nuclear power plant, and low and behold, Al Gore is right, the spin angle and momentum of the earth has changed and we now start getting more frequent, very large storms. Then what do I do?

MR. JONES: Well, see, that's the whole thing about being site specific in the way we do it. You have to have a specific type of track, a specific type of radius, specific type of wind speed for each site is different because the topography and bathymetry is different. So you could get normal storms. You could get more intensity. You could have big storms hitting New York.

But from what I said, the scenario is they would not create the storm surge actually on the Chesapeake. For instance, if you have a whole bunch of big storms coming up the east coast, the winds when you're coming off the United States into that system, and actually you would get drawdown at Calvert Cliffs. That might be a different story at PSEG or somewhere else, but at somewhere like Calvert Cliffs you would actually get nothing.

And when I did the studies up in Michigan even with Sandy they didn't even approach the record wave heights on Michigan. So it's so site specific in how the storm is going to track.

Now sea level wise is more of an issue because we know that if that rises, and that's site specific too, that as that water level rises and if you get the same storm come in of course you may exceed your margin. Of course that's slow and we have to monitor that or we may put in things where we'll evaluate every ten years or so.

But we addressed that and that's why we have so many conservatisms even in the beginning back in the '70s. So many conservatisms so that we can account for exactly what you're talking about. Because this scenario where you're actually driving it into the site is actually rare, but rarely have we had sites that actually, we haven't had sites flooded by the storm surge.

So we have to actually create observations, synthetic storms, and come up with these conservatisms to actually determine, you know, and the terminal level that would be hazardous to the site.

CHAIRMAN POWERS: Yes, we're certainly

very conservative. I'm just curious. You know, I've applied changes and, you know, and you've had plans conservatively designed, but you see those margins that you've built in start to erode. You know, how do we react to that?

MR. JONES: Well, see, that goes into the regulatory space of how often do we reevaluate it? Does the applicant if they see this is that going to trigger them to do a review? That comes into that part which is outside of this where we --

(Crosstalk)

MR. JONES: And that did happen. When Sandy came up, I know one site I'm not going to name in particular withdrew their hazard review and said we're going to have to relook at this. And then quite a few others took an account and said we'll look at bigger storms and reanalyzed their storm surge based on what happens.

CHAIRMAN POWERS: Yes, I mean that speaks well of them being responsible.

MR. LEE: Applicant, plug your ears. To a certain extent you're on the same kind of response surface here in this question if you harken back to GSI-199. It's kind of a fundamental question of what kind of margin do you have for certain types of phenomena relative to design?

CHAIRMAN POWERS: Yes, I mean it's exactly that same plane.

MR. LEE: And as new information becomes available, you know, if you want to put on your Bayesian hat you're going to update your estimates based on new information. What's that going to do in terms of evaluating ultimately risk at a particular facility?

And that's kind of a more global, generic issue that speaks, you know, that's kind of prevalent in the earth science area or meteorological area.

CHAIRMAN POWERS: Yes, and I'm not sure, that we will be careful to arm the Commission and be prepared to deal with those kinds of things. Because I mean, when is it going to have, when's the soonest you could recognize it? Well, maybe it's ten years from now.

So whatever commissioners you have now are not the same commissioners you'll have later on, so it wouldn't be the current set. I mean it's just really interesting.

MR. JONES: Well, the database isn't static, and so the question is more of a generic issue as to what --

CHAIRMAN POWERS: It has been my position for some time is we've just got to stop giving PhDs to geologists. Because, you know, those guys are going out and finding all this paleo-earthquake information that causes us to change things. So we just stop that and then the database will be more static.

MEMBER SKILLMAN: What I find interesting about this discussion, Dr. Jones, is the same phenomenon that drew down the Chesapeake Bay pushed up Barnegat Bay.

And so if you look at these large storms on the east coast, their track is the absolute center of this discussion is that if they're coming up the east coast 60 miles off you've got one scenario, but if they're coming up, if you will, the Appalachian corridor, Route 81, they're highly north of New Orleans and they're coming up over Atlanta, then you can have the same kind of situation at Calvert that Oyster Creek had.

That I'm satisfied, based on what Mark said, that the scenario including what could be the increase in water height have been addressed for this application, but what Dr. Powers said, I think, is interesting. How do we look at this in the longer run? Because it seems as if the weather patterns have changed and we're seeing some really significant storms that we really haven't seen in years gone by.

MR. JONES: Especially on the east coast.

MEMBER SKILLMAN: Yes, especially on the

east coast.

MR. JONES: The last time they had one that was in the 1930s, and then the next time you had one, Isabel, and then you had Sandy, which is a much more frequent and then anticipated and that's true.

But then you have to remember too that if you get the warming that they're talking about, sometimes those will actually knock down a number of storms because you get, as a meteorologist too as well as an oceanographer, you get the sheer, which actually will suppress the intensity or the number of storms. And then just say you have a number of storms, but how many will make landfall? And there's so many factors, and that's why we go through this thing where we don't care about, we just drive the storm in to get the maximum regardless of what the future scenario. We say this is the scenario that will do it and we just drive the biggest storms we can in there with the most conservatism to try to account for all of that.

MEMBER SKILLMAN: I think another we're seeing, at least that I see in my lifetime is like we saw Camille. We saw Tropical Lee in central Pennsylvania that just obliterated one section of the geography just north of Three-Mile Island. TMI was protected. But had that storm, had it stalled just ten miles to the south

I think there would have been other issues.

So I think we're seeing, maybe it's just a realization of how these weather events are affecting us because we have so much data available today that we didn't have before. But it certainly seems as though there have been some changes.

MR. JONES: I agree. I agree.

MEMBER SKILLMAN: Thank you Dana.

CHAIRMAN POWERS: Any other questions to pose? Mike, are you done?

MR. TAKACS: I believe so. We are done, Henry? Yes.

CHAIRMAN POWERS: Thank you very much. I'm constrained by the rules of the Federal Committee Act that you give the committee far too much free time. It's usually that subcommittees you actually --

(Crosstalk)

MEMBER STETKAR: Ask your keeper over there.

CHAIRMAN POWERS: I can?

MS. WEAVER: You can, Dr. Powers.

CHAIRMAN POWERS: I won't run into trouble with members of the public after my hide of which there were several --

(Crosstalk)

CHAIRMAN POWERS: And soon to be even more.

MEMBER STETKAR: We're just trying to increase that percent of population.

CHAIRMAN POWERS: Thank you. I'll tell you what. In that case, and for benefit of those that are coming from out of town and want to go home tonight, why don't we restart at a quarter after 12:00.

MEMBER STETKAR: That we can't do because of P&P.

CHAIRMAN POWERS: Oh.

MEMBER STETKAR: We do have to stop at noon, if you care about the two of us.

CHAIRMAN POWERS: This is the best news I've had. How long do you need?

MEMBER ARMIJO: About 12:00 to 1:00 yes.

MEMBER STETKAR: Yes, we've got quite a bit to discuss because of backup --

CHAIRMAN POWERS: So after all that you're going to still make me go back to 1 o'clock.

MEMBER STETKAR: Well, you've still got a half an hour or so if you wanted to.

MS. WEAVER: 45 minutes.

MEMBER STETKAR: 45, yes.

MEMBER STETKAR: You'll lose us at noon.

CHAIRMAN POWERS: Okay, so you want us to go ahead and get started on the next item. Can you break that at, say, 12 o'clock?

MR. FINLEY: Yes. We're not going to finish by 12:00 I don't think but we can start --

CHAIRMAN POWERS: Okay, if there's a logical breaking point.

MR. FINLEY: We'll find it.

(Crosstalk)

CHAIRMAN POWERS: Then we will do that and plan to break at noon and let these people go off to their silly meeting, which will only engender more work for me and consequently is not in my best interest. Okay, thank you.

MEMBER STETKAR: We do have an agenda item though, increase the subcommittee chairmanship for Dr. Powers right now.

(Crosstalk)

MR. FINLEY: Okay, so Chapter 9 is next. And John has the slide deck up, maybe jump to Slide 2, and we don't need to reiterate much here. We do have a lot of material for Chapter 9. Again, a lot of this is site specific so there's not at least with respect to water systems a lot of site specific discussion.

So we have material here just like the last presentation. We need to move quickly, but stop me if you do have questions. Chapter 9 was last discussed with the U.S. EPR FSAR on February 22nd, 2012.

CHAIRMAN POWERS: And that time we spent quite a little while going over this rather novel fuel handling system, and have some understanding what that system is. I still chuckle at the idea of picking things out of the bottom of the pool, but I don't think you need to go through that design information that we --

MR. FINLEY: No, and we didn't intend to. We do have one COL item I will discuss that relates to the cask itself and the mechanism to handle the cask essentially. So we'll talk briefly about that.

On Slide 3, so we do have three departures at this time, no exemptions. We'll get into the details of each of those departures. Actually two of those will go away. They're just fixes that we need to, inconsistencies between the COL and the U.S. EPR FSAR that we'll fix going forward and one departure will remain. But we'll talk about all of those.

And there are 35 COL items, so again, and there's about 30 related to fire protection itself. I'm not quite sure why, but anyway we'll talk about those.

CHAIRMAN POWERS: It always is that way, trust me. You're not unique in that respect.

MR. FINLEY: So you know me. We still have

Shankar and Bob Randall, but we have Steve Huddleston from AREVA. So with respect to Chapter 9, U.S. EPR FSAR issues, Steve should be able to help us for cooling water systems, I think.

Okay, Slide 5 just shows the agenda, the different sections of Chapter 9. So we'll talk a little bit about spent fuel handling with respect to casks. Bulk of the presentation is around water systems. We'll talk about the site specific water systems. We also have material on air conditioning, ventilation systems. And then fire protection in 9.5. So we'll start with 9.1, and that first slide is on Slide 7. So as Dr. Powers said, you've looked in detail at this beneath the pool offloading of spent fuel with the U.S. EPR FSAR. Our piece of this is really the spent fuel cask transfer facility and the cask itself.

And so we have a COL item that relates to that and since we don't have this equipment yet, detailed design, or we don't have an approved cask for this facility yet, we've really just taken a commitment to meet certain design parameters that I'll talk about here, and also some test requirements related to the spent fuel cask transfer facility itself.

CHAIRMAN POWERS: My recollection, and Dave, I think it was your issue that you raised, is you bring this system in, you hook it up and something jams in this transfer system that you have. Do you have any responsibilities for addressing that particular issue?

MR. FINLEY: Certainly with respect to the procedures themselves, there's a certain sequence that this has to be carried off in and it's our responsibility to have the procedures that enforce that sequence.

And I'm not an expert on this design, but, you know, there will be procedures obviously, and part of this requirement is to have those procedures and to do testing every time you use the system, and then also at some frequency, refueling type frequency as well.

And we also, I would mention that EDF has experience with these systems in France, and so we have the benefit of their operating experience as well, and we'll factor that into our procedures.

MEMBER ARMIJO: What is the interface between the AREVA design and where you take over, let's say, with the cask? It's an adapter device or --

MR. FINLEY: Yes, to my knowledge this spent fuel cask transfer facility and the cask itself, so the handling of the cask and the interface between the cask and the bottom of the pool is basically the interface.

MEMBER ARMIJO: Okay.

MEMBER STETKAR: You guys basically, by and on the cask and you have to make sure that it'll link up to --

MR. FINLEY: That's correct. The cask has an interface with the generic fitting beneath the pool up above that flange.

So not too much detail here except to say that if you look at Slide 8, because we don't have an approved cask design that we can point to, what we do reference is the table of design criteria, design requirements in the U.S. EPR FSAR with respect to the casks. So we commit to that.

We have to meet these seismic and structural requirements and material requirements and we'll do that. We'll do that. And we have to do that in advance, and to get the cask licensed will take some time so we'll do that.

The other 9.1 COL item on Slide 9 relates to handling of heavy loads. And again, this is more of a procedural commitment on our part to have heavy load handling procedures, to have the appropriate inspection procedures and testing requirements, load paths identified, height limits identified.

And so we haven't identified all that in terms of the details at this point, but we have commitments and we describe the elements of the program that would implement those requirements. And a lot of detail here on heavy load handling in 9 and 10.

Again, these are more or less commitments to have the procedures and the program in place. We have the basic criteria that we'll need in terms of methodology identified, but the specific procedures themselves are not in place yet.

MEMBER SKILLMAN: Mark, I'd like to ask you to confirm. Back on your Slide 8, the next to the last line on that matrix, seismic requirements. I'm looking at your application, and I should have looked at the design cert.

But the question I have is, what confirms that the seismic requirements are fulfilled both by the cask when it's sitting by the side of the road and by the cask and the jacking system that forces the cask up under the transfer tube should the seismic event occur during fuel transfer operations?

The machine's got to be able to be robust against seismic when the transfer has been completed and the pool is sealed from the cask, but the cask must also be capable of resisting the seismic loads while the transfer operation is occurring.

MR. FINLEY: Yes, so that's correct. And

all of this analysis hasn't been done but it must as you say, it must cover all points at a time, if you will, during the transfer process.

So when handling is in process, when the cask is connected to the flange underneath the pool or when it's, you know, separated and on the trolley, when it's being transported to the dry storage facility, all those points in time have to be addressed by the seismic analysis, yes. And they will be.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay, so load handling I don't really want to spend a lot of time with. That is mostly a commitment to meet certain test and inspection requirements. That moves us quickly to --

CHAIRMAN POWERS: And the testing and inspection requirements, are they onerous or non-onerous in comparison to previous plants. They're kind of the same, right?

MR. FINLEY: Yes. So to my knowledge there's no significant difference between current operating plant requirements and ours.

CHAIRMAN POWERS: And I assume you're relatively familiar with those.

MR. FINLEY: Yes. Yes. Okay, so move to 9.2 which is water systems now, and that begins on Slide

12. So the essential service water system is really a U.S. EPR FSAR system. However, there is a COL item that relates to the materials for the system that comes to us.

MEMBER STETKAR: Mark, can I, before you -- and again, stop me if you're going to cover this later. I wanted to make sure that I understood, this is organized according to individual systems and maybe you do cover it.

But I wanted to make sure I understood all of your underground piping, its materials and its protections. Because I think I understand it, but I have to really draw that information from a lot of different places. And I didn't know whether you were going to cover it, as I said I was trying to leap through here quickly. Do you have anything on that?

And rather than doing it by individual system, I wanted to see if I just had a kind of general understanding of what's where and what it's made of and how it's protected.

MR. FINLEY: I think on a system by system basis we address it in the slides. So for ESWS, for example, we'll have some discussion about --

MEMBER STETKAR: Okay, okay. Maybe try it that way. I'll just sort of keep track of what I know and what I don't know.

MR. FINLEY: And then makeup, the makeup system has its underground piping. We'll cover that.

MEMBER STETKAR: Okay.

MR. FINLEY: Okay.

MEMBER ARMIJO: Just a general question. Do you use any high density polyethylene piping? Do you do a lot or a little or --

MR. FINLEY: Our intention is to use it in nonsafety applications. We did some explorations of use of HDPE for safety applications, but essentially the codes and the methodology hasn't evolved to the point yet to use it for safety. So no safety application.

CHAIRMAN POWERS: I mean, I know that it is and we have a committee looking at HDPE.

(Crosstalk)

MR. FINLEY: Well, I know we were actively following that three or four years ago, but frankly we saw that it was a couple years off at that point and we haven't --

CHAIRMAN POWERS: At least a couple years.

MR. FINLEY: We haven't followed it closely in the last couple of years. I don't know, Shankar, if you --

MR. RAO: No, not close as to our application.

CHAIRMAN POWERS: Do you know who's heading that committee or that study group?

MR. FINLEY: I don't, Dr. Powers. I don't know.

CHAIRMAN POWERS: I'll find out.

MR. FINLEY: Okay. So on Slide 12 here, our COL item relates to the materials of the essential service water system. This is the system of course that circulates water to the UHS cooling tower basin and then back to the safeguards buildings.

This system in general, material, the valves and the piping will be carbon steel and therefore have to be protected. The underground portions of this piping will be coated and wrapped and provided cathodic protection to assure that we have protection against corrosion.

The UHS cooling towers themselves are reinforced concrete and the fill is ceramic tile. And this material has been looked at in terms of the water that would be affecting it.

MEMBER STETKAR: Those pipes, carbon steel, external coating, some sort of, I mean it says, for example, epoxy, but something like that on the exterior, interior, make sure that I understand it. I think the piping to the safeguards buildings, the 30-inch stuff, said it's going to be lined with mortar internal lining. Is that correct?

MR. FINLEY: I'm going to ask Shankar to confirm. I don't believe it's lined with mortar.

MR. RAO: Not this one. It's the inlet pipe from Chesapeake Bay.

MEMBER STETKAR: No, no, no, don't. That's why I don't want to get confused. I am focusing strictly on the 30-inch piping that goes to the safeguards buildings right now.

And the reason that I want to, I found some cases confirmatory and some cases conflicting information about the piping and how it was protected both internally and externally, which is why I kind of wanted to address this.

But in COL FSAR Section 3E.5.1, that section tells me that the pipes to the safeguards buildings are 30 inches in diameter. They are carbon steel lined internally with mortar and coated externally with epoxy.

That same section also tells me that the piping to the emergency power generation building are ten inches in diameter, carbon steel, lined internally with epoxy and coated externally with epoxy. In other words that section, and that's the only part of the FSAR anywhere that I could find any information about those pipes.

So it may be right, it may be wrong but that's the information that I have.

MR. FINLEY: Okay, let me ask Shankar.

MR. RAO: We do agree what is stated in 3E5 is the current design for the internal coating associated with this carbon steel pipe from the UHS cooling tower up to the safeguards building for the component cooling water system for the 30-inch line. And as you said, for the ten-inch line since it's a smaller IB, they're just coating --

MEMBER STETKAR: Okay, so they are lined --

(Crosstalk)

MEMBER STETKAR: Because it is somewhat relevant to Dick's questions when you get, let's say less treated water, if I can put it that way, in the cooling tower, in the SWS cooling tower basins, what's going on on the interior of those pipes also.

MR. FINLEY: Yes, and so I was going to come back. I think the next slide speaks to that. So this normal, as we spoke about earlier this morning, the normal water in this system is a fresh water. It's from the desal plant. It's also chemically treated and the coating materials long term are appropriate for that.

However, as we learned this morning, we do in emergency scenarios add brackish water to this system. And although from a long term perspective the design for the coating materials is not for that brackish water, we have looked at the 30-day design basis accident period. If you look at Slide 13 it discusses this a bit.

We've done an evaluation of the corrosion rates related to the brackish water and we see no effect in terms of corrosion rates for the 30-day period on safety system performance. So obviously, the assumption that we're making, which we think is a valid one, is that within the 30 days you will have this fresh water available or chemical treatment available to clean up the system for continued cooling.

So we addressed the brackish water question, which I think came earlier this morning, by doing the evaluation of corrosion rates over that 30-day period.

MEMBER ARMIJO: Are those pipes welded? Do they have weld joints? And if so, is the coating applied to the weld region after it's been welded? So is the coating applied after? The fabrication of the pipe --

MR. FINLEY: I'll refer it to Shankar.

MR. RAO: Per specifications, the coating will be applied at the end because it will potentially affect the coating, if you will.

MEMBER ARMIJO: Yes, right. You'd have to remove it to do the welding, but I was just wondering. So the coating's applied after the whole piping system's installed.

MR. RAO: Yes. Internally, and it's --

MEMBER ARMIJO: I guess that's okay if people know how to do that. That's great.

MR. FINLEY: Okay, so back to the question about brackish water affecting it. Does that answer it? Do you have --

MR. RAO: Yes, it's another slide. I think Slide 13 has a lot of details about it and what was --

MR. FINLEY: So 13.

MR. RAO: -- the question also is answered there about internal coating.

MR. FINLEY: Okay, yes, so this on Slide 13 speaks to the internal coating, Shankar points out for me, internal lining, two-layer fusion-bonded epoxy or Type II cement. Okay.

MEMBER SKILLMAN: Let me just respond to your question to me, Mark. This certainly addresses the issue of the piping when you introduce brackish water to components that have been bred to see fresh water you introduce to those components biological species that they haven't seen before. And unless those are removed you will get biofouling in those components, and in particular in the small heat exchangers, in the small recesses where the biological growth items hide.

And so it seems that there needs to be vigilance that when you've moved over to the brackish water the systems that are commonly fed with fresh water, you need to flush those at least in a reasonable time period or have a maintenance program that ensures that biofouling isn't going to degrade those components to where they do not fulfill their function.

MR. FINLEY: Yes, understand. And I think we have a later slide that talk about more details of the chemical treatment of the water. Of course that's a normal system. It's not a safety grade system. But normally we would maintain the water quality in accordance with some strict limits related to fresh water.

If we did introduce brackish water, then as you say it would be an emergency situation and we would have a clean up procedure that would force us to again get back within specifications for long term fresh water operation. So we would have chemical treatment systems available within 30 days and fresh water available within 30 days to do that.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay, Slide 14. I wanted to talk briefly about potable water and sanitary water. We have separate systems there. We have a potable water system, sanitary water system, and I don't know that there's a lot I need to say about that other than we do keep the systems separate from other liquid systems that would carry contamination. So neither of these systems should be contaminated in any form.

Slide 15 talks more about potable water. Its general design criteria in 60 there that it's not connected to any components or other systems that have radiological material. So we'll keep that in place obviously.

MEMBER STETKAR: Where in your presentation, Mark, are you going to talk, maybe the next slide answers that. The FSAR talks about potable water systems. It talks about raw water systems. It talks about makeup systems and things like that.

Are you going to talk to us about the desalination plant itself? Do you have separate slides on that? I don't care about the plant its on, I don't care. But that whole --

MR. FINLEY: So we have a couple slides on raw water system which feeds, actually, the desalination plant.

MEMBER SKILLMAN: Right. But if that's cut off at the inlet to the desalination plant -- let me just ask a question. Again I'm focusing on piping. It's my understanding, and this is a little bit harder for me to find, that the pipe from the desalination plant, the makeup line to the ESWS basins is indeed nonmetallic pipe. So beside the character, it says it might be fiber-reinforced plastic or high density polyethylene or something like that. Is that still the case?

MR. FINLEY: Let me ask Shankar. The material for the nonsafety makeup.

MR. RAO: There are more details on Slide 37.

MEMBER STETKAR: Okay, if we're going to get there, fine.

(Crosstalk)

MR. RAO: Quick answer to your question is yes, the supply line to these are, up to the building is --

MEMBER STETKAR: Good. And I don't want to get into something that we did this morning so I'll just --

MR. RAO: I agree. Thank you.

MR. FINLEY: Okay. Let me find out where I am here, 15. Okay, so that's potable water and I don't think I need to say anything more about that. Slide 16 again is a diagram of potable water so not much there. Slide 17 is sanitary water.

So this collects the drain, again which are not contaminated drains for the plant, and processes them. From the last bullet on Slide 17 talks again about design Criterion 60. We'll keep this separate from contaminated or potentially contaminated systems.

MEMBER SKILLMAN: What about contaminated human waste? Don't laugh. We've got the t-shirts for it. You have part of your population that receives nuclear medication and they are introduced to the men and women's restrooms. And unless there's caution you can end up with mixed waste that has a capital M for mixed and it becomes radiological waste.

What attention might you have given to rad waste, contaminated, coming from, if you will, a head just off of your RCA?

MR. FINLEY: Okay, so that's a new one on me.

MEMBER SKILLMAN: You don't have to answer here. I'm raising a flag. And it becomes very complicated because your waste water operators are not capable of handling that waste form, and even if you treat it you can't release it. And so if you've not given some consideration to the potential that you might have radiological human waste you may want to consider that at this early stage in your consideration.

MR. FINLEY: Appreciate that and we'll take that as an action.

MEMBER SKILLMAN: This is not a biggie. It's beware.

MR. FINLEY: Yes, I appreciate that.

MEMBER SKILLMAN: Do you have your own sewage operators?

MR. FINLEY: Yes.

MEMBER SKILLMAN: Okay, so you have your own sewage plant and your own treatment plant? That's where it shows up.

MR. FINLEY: Right.

MEMBER SKILLMAN: And if you're not aware that it can be present it is a mighty surprise.

MR. FINLEY: Good heads up. Okay, Slide 18. Here we're talking now about the makeup system which is essentially a site specific system. And we have both normal and emergency as we have discussed.

During normal operation we would have two UHS cooling towers in service and the normal demand for those two cooling towers is a maximum of 660 gpm. I think there was a question earlier about do we address evaporation and drift losses, and we do.

Obviously in establishing this 660 gpm maximum demand that would include the worst of the evaporation and drift and blowdown requirements. They all add up to give us that number or less than that number.

The design blowdown flow rate is based on maintaining a certain chemistry condition in the basin, roughly ten times the normal, or ten times the contaminant levels of the makeup water system that sets the blowdown flow rate.

Slide 19 talks about the emergency makeup system. So this is the safety related system and we talked about the structure that houses the makeup pumps down on the Chesapeake Bay this morning. And the flow rate for these pumps has been established. There's a minimum of 30 gpm required.

And this again, remember the difference between the 30 and the 660 is this comes after 72 hours now so you don't have the same demand on the system. The pump is actually oversized. The flow rate of each pump would be about 750 gpm each.

And some of that we use for screen wash as well. Even after screen wash we have about 510 gpm available from that pump and we need 300. So we have margin there. And again, each train has its own dedicated pump so you have four different trains and margin on each pump.

We made design requirements relative to inspection and testing. You see there the last two bullets on Slide 19. And Slide 20 shows, and this is busy and the font is small so I apologize for that. I'll talk just a little bit about how this is laid out.

So if you start with the UHS cooling tower basin that's sort of the center and upper center left of the diagram, it says cooling tower basin. So that's sort of the focus of the makeup and blowdown systems.

And you see the support systems for that basin. You have normal makeup and you have the desal plant feeding the normal makeup to the right. You have the chemical treatment plant just underneath the desal plant would again keep the water quality requirements met.

Down on the bottom shows the P&ID simplified, if you will, for the UHS makeup structure and the piping that goes from the makeup structure up the hill to the basin. We'll talk more about that. That's also underground piping and that's actually super austenitic stainless steel, so there's different --

MEMBER STETKAR: Is that coated or lined

with anything or it's just stainless steel?

MR. RAO: No.

MEMBER STETKAR: Just asking. I wouldn't think so either, but --

MR. RAO: No, it is not.

MEMBER STETKAR: It is not, thank you.

MR. RAO: It seldom provides the technique.

MEMBER STETKAR: Just asking, thank you.

MR. FINLEY: And there is a waste water retention basin, so the blowdown from the cooling tower basin will be retained in a retention basin for some period before being discharged. That's an overview of the UHS makeup system. Let me --

MEMBER STETKAR: Mark, don't leave that for a second.

MR. FINLEY: Okay.

MEMBER STETKAR: Nobody else can see this other than you perhaps. One of the things I was looking at is that under safety, your safety injection signal, it isolates the normal makeup to the ESWS and it opens the emergency makeup valve. It doesn't start to pump. It doesn't do anything.

But that valve, the vertical line there that says open, opens. It's an eight-inch line. If the test bypass valve, which is also an eight-inch line, were open

I would then drain -- well, there's no check valve in that line anywhere. There's a nice check valve in the normal makeup line. There's no check valve in the emergency makeup line anywhere.

So if the test bypass valve were open, I would now start draining my basin through the emergency makeup valve through the test bypass valve onto the ground.

Okay, that's why -- I'm glad that you said no. I want to understand why you won't do that. And don't tell me it's normally locked closed, because I used to work in a power plant and I can tell you stories about valves that were normally locked closed that were not.

(Crosstalk)

MR. RAO: We do have a plastic protection for this piece of pipe that goes into the basin. It goes on top of the, or highest elevation. It goes down and in and have a syphon breaker on --

MEMBER STETKAR: Thank you. that's all I needed to know. Because I was looking for that information. I couldn't find it in the FSAR. If it's in there I overlooked it. Thank you. That's all I needed to know.

(Crosstalk)

MEMBER STETKAR: I had a different way in my mind that it might be protected, but this is much better. Thanks.

MEMBER SKILLMAN: And this one's for you. Are you going to talk about a departure?

MR. FINLEY: Yes, I'm glad you mentioned that. I was just going to say, and Dr. Stetkar mentioned it. I should have mentioned it earlier. So again on Slide 20, so you can see if you look hard, a line that's underneath the UHS cooling tower basin called the post DBA UHS makeup keep-fill line. So that's an important line and we'll talk about it as a departure here in a little bit.

But the purpose of that line is to maintain the UHS makeup line, the emergency makeup line full at all times so that when you do get a demand for emergency makeup you don't have empty pipe and you don't have a concern about water hammer.

So that keep-fill line is an important addition that we've made in our site specific design which is not discussed in the U.S. EPR FSAR and therefore it's a departure, but we needed to keep the line full so that we don't get water hammer.

MEMBER SKILLMAN: So this is a departure to the benefit not a departure to the detraction. This is a benefit.

MR. FINLEY: This is a --

MEMBER SKILLMAN: It's a design enhancement.

MR. FINLEY: Well, I suppose I could answer that two ways. The fact that we have a water hammer risk is not good.

(Crosstalk)

MR. FINLEY: Right. So we addressed that with a keep-fill line. So we need a keep-fill line because we have the water hammer risk.

MEMBER SKILLMAN: Yes. Now the issue is the pressure boundary isolation valves, pressure boundary isolation valves. What's the quality classification? What's the instrumentation? And how do you know you have the capability to know when you need to use that and the assurance they'll function when you tell them to function?

MR. FINLEY: Okay, I think there was a lot there. But with respect to the keep-fill, so we do assume some boundary leakage to establish the design flow requirements for the keep-fill system. It's small and --

MR. RAO: Five is too much but --

MR. FINLEY: Five gpm. So as you can see on this diagram that flow comes off of the ESW pump flow, which is a very high, you know, flow rate, 1,000 gpm or more. So the 5 gpm that we siphon off for keep-fill is a very small in that regard. So I don't know if you were speaking about boundary leakage with respect to keep-fill or other --

MEMBER SKILLMAN: No, I was just talking about the boundary isolation valves, but what is there better --

MR. FINLEY: Okay, maybe Shankar --

MR. RAO: All the boundary isolation valves associated with the safety function protection of the pressure boundary are safety related class 3, ASME Section 3, including the manual test bypass valve which you see, which was the question --

All other isolation valves including the blowdown isolation and the emergency blowdown isolation, the normal makeup isolation, they're all boundary valves are safety related.

MEMBER SKILLMAN: Thank you. Thanks.

MR. FINLEY: Any other questions about the UHC makeup system, normal or emergency?

CHAIRMAN POWERS: Is this appropriate place?

MR. FINLEY: I think this might, I was going to say that. I think this might be a good place to break.

CHAIRMAN POWERS: Why don't we break until 1 o'clock then, and we'll resume this discussion. And those of us that are going to the P&P meeting will look for my veto power. Those of us not can study ahead, anticipate, so we'll blind side Mark when he comes back.

MR. FINLEY: Thank you.

CHAIRMAN POWERS: We are recessed until 1 o'clock.

(Whereupon, the foregoing matter went off the record at 11:53 a.m. and went back on the record at 12:59 p.m.)

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

(12:59 p.m.)

CHAIRMAN POWERS: Let's come back into session and continue with the Mark Finley show.

MR. FINLEY: Okay, Dr. Powers, thank you. So I'm on Slide 21 and here, we talked a little bit about it, but with regard to chemical treatment we do treat the makeup water. Essentially we maintain the water quality in the UHS cooling tower basins within freshwater limits.

On Slide 22 it shows the different parameters that we'll control with the biocide, algaecide, pH, corrosion inhibitors, scale inhibitor, silt dispersant. That's the intention of the chemical treatment system, so we'll maintain that as a normal occurrence.

Slide 23 talks more about water quality and water chemistry. There's a COL item in the U.S. EPR FSAR that sets up parameters in a table, 9.2.5-5 there, and essentially we need chemical treatment to stay within those parameters and we have that chemical treatment system.

The normal freshwater makeup will be slightly outside those bounds but the chemical treatment brings it within the bounds, so we'll stay within bounds normally as we've said.

Slide 24, just to touch again on the emergency conditions.

MEMBER ARMIJO: Mark, on that water chemistry, is that basically what you're doing right now at Units 1 and 2, same type of water chemistry treatment?

MR. FINLEY: So Units 1 and 2 have a once-through cooling system, both for their --

MEMBER ARMIJO: Do they need this?

MR. FINLEY: They have a different need. So they do have biofouling issues and they do have treatment to control that, but they don't have a similar basin so I imagine ours is going to be different to that extent.

But to the extent that we learn lessons about the Bay and brackish water, yes, you know, we keep in contact with Calvert Cliffs 1 and 2 and the lessons they've learned. So we'll have that chemical treatment information from them, but our need is a little different with the cooling tower.

So emergency situation, I mentioned once before that after 72 hours we need brackish water in the emergency situation and so, as a result of that, we'll be outside of the parameters in that U.S. EPR FSAR Table 9.2.5-5.

So we've looked at that and evaluated that for a 30-day period, specifically looking at total dissolved solids and demonstrated through analysis that that's acceptable.

We also offered an ITAAC, as you see in that last bullet, to confirm performance of the towers and verify with the final design analytically that we'll have the performance we need for 30 days.

Slide 25, this is materials now for the makeup system. So we've talked about the 60-inch pipes already and these are also lined with cement, as were the 30-inch pipes we talked about, and they're coated on the external side with an epoxy and they will also be cathodically protected.

And we can isolate one or the other and still maintain 100 percent flow, which gives us some capability to do maintenance on those pipes.

With respect to the vertical pumps, we talked about the makeup pumps themselves. Those will be super austenitic stainless steel and that obviously can deal with the brackish water in the Bay.

The next slide --

MEMBER ARMIJO: Mark, before you go on there, you know, I'm a metallurgist and I've been in this business a long time. I've never heard of the term super austenitic stainless steel, austenitic stainless steel of course, but is this a new alloy?

MR. RAO: It look like it say ASME-approved material. SB 190 I think is the number.

MEMBER ARMIJO: Is it duplex microstructure?

MR. RAO: Yes. It's a duplex stainless steel also --

MEMBER ARMIJO: It's not a casting? It's forged or --

MR. RAO: Pipes are made, these are seamless pipes, pipe-wise as far as I know.

MEMBER ARMIJO: Yes, seamless is not the issue. Is the microstructure very unusual or chemistry very -- could you provide some information to us on that, what the chemistry is?

MR. RAO: We can provide the detailed material specification for it from the ASME.

MEMBER ARMIJO: Yes, the chemistry, mechanical properties and microstructure.

MR. RAO: Sure.

MEMBER ARMIJO: Because, you know, if it's a new material, I'd like to know more about it.

MR. RAO: It's also known as AL-6XN. I don't know what --

MEMBER ARMIJO: There's lots of stainless steel --

MR. RAO: It's a commercial name.

MEMBER ARMIJO: -- but I've never heard the term super austenitic. It may be a vendor's term to charge you more money.

(Laughter)

MEMBER ARMIJO: And I'm not going to criticize that.

(Crosstalk)

MEMBER ARMIJO: I'm very wary of introducing new materials that you haven't got a lot of experience with so that's the only reason. It may turn out to be something I'm familiar with.

MR. FINLEY: Okay, we'll take an action to get you that information. And Slide 26 in terms of piping and valves in the makeup --

MEMBER STETKAR: That actually might be important because those lines are normally stagnant, filled with stagnant, brackish water. I mean you're going to flush them up through that test line but that test line is up on the hill, right?

MR. FINLEY: Right, right.

MEMBER STETKAR: So under normal circumstances they're full of brackish water.

MR. FINLEY: That's correct, which is why we choose this material. However, as opposed to before, you know, from the staff's questions and our response to those questions, we have the capability to do periodic flushes and we'll do that, I think quarterly, so with some frequency. So it'll be stagnant in between but we'll do testing and flushing on a quarterly basis.

MEMBER STETKAR: But it is exposed to brackish water 365 days a year.

MR. FINLEY: Yes, yes. But this stainless steel is super austenitic.

(Laughter)

MEMBER ARMIJO: It may be just fine. I'd just like to know more about it, that's all.

MR. FINLEY: Slide 26 just states that we do use that same material for the piping, the 8-inch buried piping from the makeup water structure up to the basins for emergency makeup with strainers on the discharge side of those pumps that are also super austenitic stainless steel.

Slide 27, this is sticking with materials here and different aspects of the ESWS cooling tower, the blowdown system, both emergency and normal. I don't think we've identified the material specifically yet but they will be compatible with the brackish water in both cases.

The screen wash system, same way, be constructed of materials compatible with brackish water.

Slide 28, okay, so we're out of the materials questions with respect to ESW and the makeup system and now we're into UHS cooling tower performance.

And this first COL item has to do with the effects on safety-related ventilation resulting from the UHS cooling tower plume interference effects.

And we've done some significant work here on this particular COL item and, as well, one that is similar, which is what is the recirculation effect of the plume on the tower itself? This is more the effect of the tower plume on other systems, but we'll talk about both effects here shortly.

So what we did is we modeled the site, the structures on and around the site that could affect the plume and the flow paths associated with the wind and the plume.

We've actually done some quantitative analysis using computational fluid dynamics to model the actual temperature increase at the intakes to the main control room and safeguards building ventilation systems.

We've determined that effect even under the worst conditions. We looked at wind from directions all around the compass, 360 degrees. We looked at wind speeds up to that which is reasonable, which is about 22 miles an hour, 10 meters per second. Wind speeds higher than that are really low probability for any duration.

And we calculated the worst increase in temperature to be 2.5 degrees, or I should say something less than 2.5 degrees.

And then we demonstrated that the design of these ventilation systems have the margin to accommodate that kind of an increase over and above what the ambient temperature is. So through that quantitative analysis, we've answered this COL item.

CHAIRMAN POWERS: One of the questions that I'm sure the ACRS committee will have is why do you think your computational fluid dynamics was an accurate portrayal of the flow field around the plant?

MR. FINLEY: Yes so, you know, I'm not the expert and Shankar can help here, but so we've done some sensitivity studies, looked at perturbations of different parameters, calculated uncertainty on the order of 3-1/2 percent, which for this temperature is small. It's .1/.2 degrees, something like that. So we think this is pretty accurate and a good quantification of the impacts.

CHAIRMAN POWERS: One of the pieces of

corporate knowledge that exists within the ACRS is a portrayal of the CFD analyses, the flow field around an automobile.

And as it progressed between the initial cut and after, as experiments were done to further refine that, and it went from completely unintelligible flow map to one that actually looked like flow around a car, and the point being that without some experimental calibration that the CFD models tend to be precise but not very accurate.

MR. FINLEY: And I see we have some experts on the staff that I'm sure can better answer your question, Doctor. They have done an audit of at least the first version of this work that we did so they can respond to that.

We did do a V&V process and took some test cases and compared results from our methodology to published results for those test cases, so that's been done. More than that I can't say.

I don't know if now is a good time or maybe during the staff presentation you can ask those same questions. You'd probably get a better answer. I don't have my CFD expert here. Shankar, you want to chime in or --

MR. RAO: The only thing I was going to

point out, like you were talking now, a validation/verification process was followed in accordance with the ASME, V&V methodologies, where three different test analyses were modeled and replicated in the results also.

CHAIRMAN POWERS: I can assure you the ACRS experts in this area will tell you that that is a necessary condition but it is not a sufficient condition to validate these things.

MR. FINLEY: Okay. Well, I have given you my warning.

CHAIRMAN POWERS: You could have given me almost any answer and it would have been impossible to address it but I can forewarn you that that is a question that --

MR. FINLEY: I appreciate that and I can tell you that the staff has looked pretty closely at this. We have had an audit and stuff, but I'm not an expert, so.

CHAIRMAN POWERS: Well, Mike, I hope after you will explain how the staff drew comfort from this analysis.

MR. TAKACS: Yes, I will.

(Crosstalk)

CHAIRMAN POWERS: Quite frankly Dr.

Banerjee is less charitable in this area than I am.

(Crosstalk)

MR. FINLEY: I should also point out, Dr. Powers, it's still an open item. This issue of interference and recirculation is still an open item and so technically we're not trying to close that today.

CHAIRMAN POWERS: I understand.

MEMBER SKILLMAN: Is this also the target of a departure?

MR. FINLEY: No, we actually term this a variance and we analyze it as sort of a transient condition. We have not termed this a departure.

MEMBER SKILLMAN: Okay, thank you.

MR. FINLEY: Yes. Slide 30 now speaks to the maximum evaporation and drift water loss. This is, I'm sorry. Did I skip a slide, here? Okay, Slide 29. This is the evaporation and drift losses during the first 72-hour period.

So what we've done here is reviewed our 30-year temperature data, hourly regional climatological data and compared that to what's in the U.S. EPR FSAR because they have a similar time frame they've looked at, and our temperature data is actually identical to what's used in the U.S. EPR FSAR.

MEMBER STETKAR: I wanted to ask about

that. I understand that the EPR FSAR uses the data from the Patuxent Naval Air Station.

MR. FINLEY: Yes.

MEMBER STETKAR: They're identical.

MR. FINLEY: Yes.

MEMBER STETKAR: Which means that if I have a site in Arizona, my evaporative losses are not going to be bounded by the DCD and if I have a site in Louisiana, let's say, or something like that, my minimum cooling is not going to be bounded by the DCD, right?

MR. FINLEY: I can't speak to those sites but it could be. It could be. Steve Huddleston --

MEMBER STETKAR: In other words, the DCD is not bounding for the Calvert Cliffs site. It is precisely the Calvert Cliffs site.

MR. FINLEY: It is precisely the Calvert Cliffs site with respect to this data, yes.

MEMBER STETKAR: Yes, okay. Just wanted to make sure that --

MR. FINLEY: Correct, Steve?

MR. INFANGER: We recognize the difficulties and that's why we --

MEMBER STETKAR: It's no problem for you. I'm just curious. I haven't seen that as --

MR. FINLEY: Steve Huddleston is with

AREVA. Maybe you can speak a little more, Steve, on --

MEMBER STETKAR: It said UniStar. That's why I was --

MR. HUDDLESTON: Yes, our point is that all of these values, of course, are going to be site-specific.

MEMBER STETKAR: Sure.

MR. HUDDLESTON: And each site needs to show in their own way that they're either valid or not and how they're addressing it.

MEMBER SKILLMAN: Okay. Well, isn't that the artifact of a Part 7, I mean, of a 52 license? This is the RCOLA and, since it is, this is the reference.

MR. HUDDLESTON: No.

MEMBER SKILLMAN: Because most other design cert applicants derive a temperature profile and certify the design against that temperature profile.

It could be a made-up temperature profile and then each individual applicant then says, well, that temperature profile bounds it based on my site-specific data so I don't have to do any other analysis or it doesn't bound it and I have to do some additional analysis.

MR. FINLEY: This is not the typical case --

MEMBER SKILLMAN: This is not the typical case.

MR. FINLEY: -- in terms of comparing RCOLA to the design certification. Normally there's margin. I think this is affected, and correct me if I'm wrong, Steve, but this is affected based on a decision that was made sort of late in the game in terms of submittal of both the design cert and the RCOLA to put the UHS cooling towers in the design certification. I don't think that's always the case.

MEMBER SKILLMAN: That's why I think it's really --

MR. FINLEY: Right.

MEMBER SKILLMAN: Because of the way Part 52 is written, this is in the design cert but it is also the RCOLA. Now at Susquehanna, team's going to have to take a look at this and either agree or disagree.

MR. FINLEY: Right, right, right, right.

MEMBER SKILLMAN: That's what I'm saying.

MR. FINLEY: No, you're right. And I'm just saying in this case I think this data and this design started as a site-specific Calvert Cliffs design that was then migrated to the design certification.

MEMBER SKILLMAN: To the DC.

MR. FINLEY: So there's a different sort of history to this than most other systems.

MEMBER SKILLMAN: But it ends up being that exact --

MR. FINLEY: Right.

MEMBER SKILLMAN: Yes?

MR. FINLEY: Right.

MEMBER SKILLMAN: Okay.

MR. FINLEY: Right. Okay, so I'm on Slide 29. So for the first 72 hours we're identical, essentially, to the design certification in terms of the makeup water required. We have the same requirements and we meet those requirements. In terms of the volume of the UHS basin, it has adequate volume to handle this kind of loss over the 72 hours.

The makeup then kicks in at 72 hours on Slide 30. Similarly we use the same temperature data after 72 hours until the 30-day period expires and this is the analysis that demonstrates that 300 gpm is adequate to provide makeup for one tower at this point and we've already talked about that.

Our pumps have a capacity of 750 gpm and even with some screen wash flow taken away there's plenty of margin to that 300 gpm.

Okay, Slide 31, same topic here. We're just continuing to talk about the meteorological conditions, and after 72 hours our makeup is adequate.

Slide 32, okay, so here is a COL item that relates to the UHS cooling tower recirculation and interference.

So as you see in the COL item, it says, "confirm that the site characteristic sum of the 0 percent exceedance maximum non-coincident wet bulb temperature and the site-specific wet bulb correction factor does not exceed the value."

Okay, so for the Calvert Cliffs site the value that's in this table in the U.S. EPR is actually exceeded. That value is 81 degrees for wet bulb temperature. The Calvert Cliffs site non-coincident wet bulb 0 percent exceedance temperature is actually 85 degrees.

So we looked at that 85 degrees in the context of the worst 24-hour temperature data that we found in a 30-year period and we calculated the correction factor, which represents this recirculation between towers.

And again using that same computational fluid dynamics model that we just talked about for the other impacts and we calculated that correction factor as less than 2.5 degrees.

We added the 2.5 degrees to the 85 degrees, actually the hourly temperature data before and after the 85 degrees, and determined that the maximum basin temperature doesn't exceed 95 degrees, if you followed all of that. Okay.

MEMBER STETKAR: It was actually easier to follow when you said it than it was to follow when I read it.

MR. FINLEY: Okay, good. However, there's one complexity here, Slide 33. We do have a departure now but it is going to go away, and the issue is we're not aligned with the data in the design certifications at this point.

We got a little bit ahead of the design certification as it turns out. Not quite sure why, but in any extent we adjusted our temperature, the timing of our temperature data to coincide with the heat discharged to the cooling tower in our transient analysis and when we did that it put our data out of sync with what's in the design cert.

However, it's only because the fact that the design cert revision hasn't caught up with what we have in the COLA now. They are also going to change the timing of their data so this departure will go away and, again, will be identical to their transient. Okay.

CHAIRMAN POWERS: We really should not

worry about this.

MR. FINLEY: Right, no, no. We're going to get back to identical that we talked about before.

MEMBER SKILLMAN: But the question is does the NRC staff concur with the change to the design cert such that the design cert and Calvert Cliffs are one and the same?

MR. FINLEY: That's one for them I think.

MEMBER SKILLMAN: That's one for them, okay. Okay, thank you.

MR. FINLEY: They haven't reviewed. I don't think it's been submitted yet but, anyway, they'll answer it.

MEMBER SKILLMAN: You're betting on the cone.

MR. FINLEY: They'll answer it.

CHAIRMAN POWERS: I can't keep track of all the resubmissions and things like that, but they're all in Phase 4 in the design cert so it'll be a while before it comes back to us, okay.

And I think Mark's point here is that we don't need to spend a lot of time on this until Phase 4 because it's just not going to be operational if we just wait a while.

MR. FINLEY: Right. To stick with

departures just a second, you remember I said that there were three and two of them were going to go away, so this on Slide 34 is the second departure and this one also will go away.

We took a departure because at least the way we read the U.S. EPR FSAR table that depicts the alarm and permissive logic related to the makeup pump that's driven by the basin water level, that we could not manually start our makeup pump until after the water level got below low, low, low. We felt that we wanted to depart from that and be able to manually start that pump sooner.

And AREVA also agrees and they're in the process of working a change. Actually I do think this one's been submitted already that corrects this wording and so this is also a departure that in our next revision, Revision 10, we should pull out.

MEMBER STETKAR: Mark, I wasn't going to ask you this but --

CHAIRMAN POWERS: But you're going to anyway.

MEMBER STETKAR: But I'm going to anyway since we have Dr. Powers running such an efficient meeting that we now have extra time.

I read and I can't quote sections here, but in the FSAR I believe it says, I know how the system starts. You get a safety injection signal. The isolation valve up at the ESWS opens up and then the operators decide at some time to start the pump and deliver the flow.

There are some words in there that says after that point level is controlled automatically, which implies that there's some sort of level sensor that cycles or throttles some valve. Is that correct --

MR. FINLEY: I'm going to defer --

MEMBER STETKAR: -- or is it strictly manual on/off control of level?

MR. FINLEY: I'm going to defer to Shankar on that.

MR. RAO: The level is indicated in the control room?

MEMBER STETKAR: Yes.

MR. RAO: And the operator has the control of the pump in such a way that he can terminate the pump if needed or turn it in the recirculation mode by closing the isolation valve.

MEMBER STETKAR: You may want to look at the FSAR because there's some implication that once that -- now, I can't quote. This is something I just remembered. I didn't write it down because it's not super important.

But just in terms of accuracy I believe there's some implication that once the operator turns it on it's basically hands off and there's some sort of automatic level control in the point ESWS basin, which would imply throttling of some valve someplace or cycling of a pump or something like that.

MR. RAO: I will double-check that.

MEMBER STETKAR: Double-check. Just, as I said, I didn't write it down because I wasn't particularly concerned about it, but since you brought up this other thing, I thought I'd mention it.

MR. FINLEY: Yes, in general I should add that we didn't want automatic start of the makeup pump just because of the brackish water/freshwater situation. We wanted that to be controlled by the operator through procedure.

Okay, Slide 35, so this is the third departure and this is the one that will remain. I already spoke about this. This is the keep-fill piping that we added to make sure we don't have dry piping associated with that makeup pipe which goes a significant distance from the Bay up to the power block area, so we'll keep that filled with water.

It's from a safety-related source, essentially the essential service water system, and it draws very little demand from that system. Okay, that's Slide 35.

And no need to repeat the discussion on 36. I think we pointed out that keep-fill piping once before on Slide 36 so don't need to talk about that.

So Slide 37 is the raw water system and this is Chesapeake Bay water basically and it feeds the desalinization plant. There'll be no cross-connects between the raw water system and any other system that has the potential to carry radioactive material.

We have done flooding analysis associated with this system such that failures of piping or components, any flooding caused by that, have been evaluated.

And Slide 38 is also raw water and so we do have storage tanks, raw water supply storage tanks and, again, graded the sites such that that water, if the tank were to fail, the water would be diverted to the drainage system and not affect the plant.

MEMBER STETKAR: Oh, by the way, I found the statement if you -- I'll help you guys now. It's in Section 9.2.5.5 of the FSAR. It says, "Once the UHS makeup water pumps are started manually, subsequent operations are accomplished automatically to provide flow to the UHS cooling tower basins," which implies some sort of levels are falling.

MR. FINLEY: Okay, okay.

MEMBER STETKAR: That's where I stumbled across it.

MR. FINLEY: Okay, so that does it for the water systems. 9.3 really is process auxiliaries and we don't have COL items in this area. I mean, incorporate by reference completely what's in the U.S. EPR FSAR, so there's really nothing to discuss there. That's compressed air, sampling, equipment and floor drainage and chemical and volume control.

Then to Section 9.4 on Slide 42, so the site-specific ventilation systems we have. I'm not going to talk about the generic systems. We incorporate all of those generic safety ventilation systems by reference.

So I'll talk about the site-specific systems. The first is the turbine building ventilation system. It's nonsafety related, doesn't serve any safety-related functions. Maintains the turbine building within the proper equipment operating temperatures. Its just nonsafety function is to keep dirt and dust out of the turbine building.

And there are no radiation functions it performs, no safety actuation signals provided to this system from other systems and there's no operator action required to respond to plant events associated with this system, so there's no safety function.

Similarly, Slide 43, switchgear building ventilation system. Switchgear building is actually tied directly to the turbine building so it's essentially the same structure.

However, we have a separate ventilation system. In this building, of course, we have all the electrical switchgear. We also have the station blackout diesels. However, the station blackout diesels have their own ventilation system which is described in the U.S. EPR FSAR.

For the switchgear building ventilation, similar to the turbine building ventilation there are no safety functions or radiation control functions that the system performs. It strictly maintains equipment operation.

Slide 44, we do have site-specific -- yes, I'm sorry.

MEMBER STETKAR: Two things. There is an open item because you don't have the design for the switchgear building ventilation system yet.

I bring this up repeatedly, is the term. You carefully in this presentation used the term there is no safety-related equipment in the turbine building or the switchgear building, which is a statement of licensing fact.

The phrase that is used repeatedly in the FSAR is that there is no equipment important to safety in the turbine building or the switchgear building ventilation system.

In the COL FSAR, there is a long list of systems that are included in the design reliability assurance, I'm sorry, in the EPR FSAR, the design cert FSAR.

In Table 17.4-2 in particular, there are a long list of systems that are included in the design reliability assurance program because they are not safety related but they are important to safety.

And they include things like the feedwater system, the main steam system, non-class 1E uninterruptible power supply, normal power supply, 12-hour uninterruptible power supply, turbine generator instrumentation control system, a lot of stuff that is located in the turbine building and the switchgear building.

So there seems to be some disconnect about the statement that says these ventilation systems don't supply any locations with anything important to safety versus the design certification that lists nonsafety related but important to safety, at least within the construct of the reliability assurance program definition of important to safety. You may --

MR. FINLEY: Right, so I think we --

MEMBER STETKAR: I'm going to ask the staff about this also because they basically signed off that everything is okay.

MR. FINLEY: I think we have to look at that. I'm not sure the definition of important to safety --

MEMBER STETKAR: Well, it's a problem these days because especially with the new plants there are -- active plants are less susceptible than passive plants but there are large numbers of systems that are now not, quote/unquote, "safety related" from a licensing basis but are designated as important to safety for enhanced maintenance, enhanced reliability, enhanced availability controls outside of the tech specs let's say.

MR. FINLEY: Right, right. Okay.

MEMBER STETKAR: And in terms of the general design criteria, they say important to safety. It doesn't say safety related. And the staff in other guidance has interpreted safety related as a subset of important to safety. This is a subtle licensing point but I'm going to ask the staff so I hope the staff --

MR. FINLEY: We will take an action in terms of any corrections that might be needed or clarification that might be needed for the FSAR --

MEMBER STETKAR: I was going to say orally, as you stated, is purely a statement of truth. There is no safety-related equipment in those locations.

MR. FINLEY: Shankar, did you want to add anything to that?

MR. RAO: As pointed out, there may be some other enhanced features that should be provided by augmented quality principle for some of this equipment where we have multiple off-site power supplies and/or we do have more than one train of electrical supply in the switchgear building, those kind of things. We have provided multiple feedwater pumps.

MEMBER STETKAR: It's okay except for the fact that their just blanket statement says that this isn't important because it doesn't supply anything that's important to safety.

MR. FINLEY: We have to look at that. Sounds like a conflict in the FSAR itself, so we'll have to fix that or clarify it.

MEMBER STETKAR: I just wanted to raise

that because it's, as I said, raised it in some cases. In many cases on the passive front designs it's much more important because most of their active equipment is not safety related but it is, quote/unquote, "important to safety."

MR. FINLEY: Okay, good point. Slide 44 speaks to the nonsafety-related ventilation system we do have in the RCOLA, so that UHS makeup water intake structure we've talked about this morning. That's a ventilation system and it will maintain temperature within the structure acceptable for equipment.

We have four trains I spoke about earlier. There are also four ventilation trains so they're independent of one another and they'll maintain the conditions needed for the equipment to operate.

Slide 45 speaks again to this UHS makeup water intake structure ventilation system, some more details of that for the different rooms and the traveling screens, et cetera. Don't think I need to go into detail there.

And we have additional ventilation system for the fire protection building, Slide 46. Fire protection building we have two, 100 percent capacity diesel-driven fire pumps.

We also have an electric motor-driven fire pump and we have ventilation in that building for the equipment to maintain temperatures as you see there, maximum 120, minimum of 40.

We also have a self-contained, diesel-driven power supply for ventilation system so that essentially we have a backup to normal offsite power since the power there in the diesel building is not backed by station blackout diesel or the normal safety diesel.

We have a separate diesel in that building to provide power for ventilation for the structure as a backup to normal offsite power.

MEMBER STETKAR: Unfortunately I have to babble a bit more here. First question is if I look at your third bullet there, the system is designed based on an ambient temperature of -10, maximum 100.

The other plant ventilation systems are based on a minimum temperature of 0 dry bulb and a maximum of 102 dry bulb. I don't care that you've designed this for colder weather.

I was curious why this particular system uses a maximum ambient temperature of 100 degrees and everything else uses 102. I suspect it doesn't make much difference to the system design in the real world.

MR. FINLEY: I'm also wondering whether we have a typo here but --

MEMBER STETKAR: No, you don't.

MR. FINLEY: No?

MEMBER STETKAR: It's in the FSAR.

MR. FINLEY: Nonsafety.

MEMBER STETKAR: You may want to look at that.

MR. FINLEY: We'll look at that.

MEMBER STETKAR: I know, as I said, as a practical matter it probably doesn't make any difference but --

MR. FINLEY: It's not a --

MEMBER STETKAR: It says somebody looked at a different temperature to design this system but then it tells me --

MR. FINLEY: It's not a safety-related system.

MEMBER STETKAR: No, it's not.

MR. FINLEY: I will say that, but --

MEMBER STETKAR: Yes, it's not a safety-related system. The fire protection system is one of these enhanced controls world, the fire protection stuff.

MR. FINLEY: Yes, yes, yes. Okay, we'll look at that.

MEMBER STETKAR: Now, regarding the

system, we're not going to talk much more about the system itself, right, the fans and the dampers?

MR. FINLEY: The ventilation system, no.

MEMBER STETKAR: Right, okay. I did have some questions about that system in particular because I look at fans and dampers and things like that.

This statement in the FSAR in Section 9.4.16.2.2 so you have it on the record, it says this system, in the fire protection ventilation system, has motor-operated air supply dampers, and I don't want to get into the reliability. It says there's two. I don't know why there's two. That's okay.

However, there's a statement that says, "The motor-operated dampers fail to the open position in the case of a power loss."

Me, I've seen a lot of motor-operated dampers and you can, in principle, design them to fail open on loss of power but if it's a straightforward motor-operated damper they tend to fail wherever they were on loss of power. So you may want to check that statement.

The reason I raise this is that there are several discussions of how this system performs and it's alluded to in your last bullet there and perhaps the explanation is these diesels that you talked about, but

I don't know what they power because they're not really described in anything that I saw in there.

There are statements like this that says dampers fail open on loss of AC power which are curious and statements that says, "In the event of a station blackout, emergency power is supplied to the fire protection building ventilation system."

Now, station blackout, by definition you don't have emergency power so that can't be correct. That can't be a statement of fact.

I don't need answers today. You probably don't have the people here, but I think you need to look at that section of the FSAR that describes that system design and in particular its response on presumed loss of power or station blackout.

As I said, that last bullet that you have here, I actually didn't see anywhere a description of the fact that that diesel existed.

MR. FINLEY: So that's a recent submittal and I'm not sure it made Rev 9 --

MEMBER STETKAR: Okay. I'll tell you it's not. I read these. I trust you. I've never seen a diesel.

MR. FINLEY: It's on the docket but I don't believe it's in Rev 9 yet so --

MEMBER STETKAR: So I don't know, for example, if that's just a diesel engine to drive the fan or whether it's a little diesel generator that also supplies power.

MR. RAO: It's a diesel generator.

MR. FINLEY: But go ahead. Look for answers.

MEMBER STETKAR: But if it's a diesel generator then, you know, it didn't exist in Rev 9.

MR. FINLEY: Right.

MR. RAO: It was added --

MEMBER STETKAR: Okay.

MR. RAO: Staff question and RAI and, but it --

MR. FINLEY: Well, I was just going to say we might also in Rev 10 clarify that wording you just --

(Crosstalk)

MEMBER STETKAR: Check. It sounds like this part is in a bit of a state of flux between Rev 9 and Rev 10 so it's --

MR. FINLEY: Right, right. It's really a loss of off-site power. It's not a station blackout scenario. This system doesn't get the safety diesel or station blackout diesel or --

MEMBER STETKAR: Yes, okay.

MR. FINLEY: Shankar, you were going to maybe speak about dampers.

MR. RAO: Yes. The point I was going to make for that was the motor-operated dampers will fail as is typically.

MEMBER STETKAR: Typically they do. This is --

MR. RAO: So what we meant probably, and we will double-check that, is that they fail to open position because they're normally open, but we will confirm that.

MEMBER STETKAR: Okay, that may be the --Okay, thanks.

MR. FINLEY: So that does it actually for ventilation unless there's other questions on ventilation.

The last section is 9.5, which is plant protection and this is where, as I mentioned earlier, we have a number of COL items so I'll go over these quickly.

But the first one is so we need to describe the simplified fire protection system, P&ID. So let's flip to Slide 49 and I know it's hard to read but we're not going to look at the small print hopefully.

Start with sort of the lower left-hand corner of this figure. You've got the fire protection building there. You can see the two diesel fire pumps and one electric-driven fire pump.

So that's the supply for all the rest of the distribution system on the site so that supplies directly the nuclear island fire protection loop as you see. It's kind of in a reddish ink there.

And then the turbine building loop is connected to that, and then connected to the turbine building loop is the main cooling tower loop to provide fire water distribution to the main cooling tower.

There is also an offshoot on the top left side. John, if you go up here, yes, top left side. So that's piping that comes off the NI loop and goes down to the structure on the Bay, the UHS makeup water intake structure. So this is the fire, sort of a high-level P&ID for the fire water distribution system.

One of the things to mention here is this system, at least with respect to the nuclear island, needs to function after an earthquake so this, although not safety related, it is going to be seismically qualified so that it's functional after a seismic event. That's a requirement in Reg Guide 1.189.

Okay, so Slide 50 speaks to fire protection for the cooling towers and so I showed you that there is a loop that surrounds the main cooling tower to provide the fire protection we need in accordance with the NFPA 24, supplied two independent supply lines as you saw in the P&ID. We have automatic fire detection, fire alarms and portable fire extinguishers there as well.

Slide 51, this is monitor and maintain acceptable level of quality in the fire protection system, freshwater storage tanks.

So this water is fed from that desalinization plant that we talked about earlier. We'll provide makeup as necessary. We maintain storage in two separate tanks and we'll treat it as necessary with corrosion inhibitors as required.

Slide 52, perform a supplemental fire protection analysis for site-specific areas. In Appendix 9 Bravo we have performed a fire hazards analysis to supplement that which is in the U.S. EPR FSAR.

Demonstrates that we achieve and maintain safe shutdown conditions for a fire in any area of the plant including the alternative shutdown fire areas. I don't know that there's any other points that I need to make on this slide.

MEMBER STETKAR: Yes, there is.

MR. FINLEY: Obviously there is.

MEMBER STETKAR: What's in there is a summary and I didn't study it in detail because it's not what I get paid to do. However, I'll come back to this notion of important to safety stuff.

And in the table, there's a big table that summarizes the result, 18-page table, whatever it is, 9 Baker dash 2, 9B-2, and in that table there are line items that says, it goes fire area by fire area. It summarizes what's in it, whether the pipes are fire hazards, et cetera.

If I looked at that table, there were four fire areas that had yes under important to safety equipment. Those are the four UHS makeup pump divisions because they're kind of combinations, and I understand that. That's correct.

None of the other turbine building locations, we already talked about turbine building ventilation so the whole turbine building and the switchgear building, and none of those buildings had anything that was important to safety so I don't need to say that again.

However, when you looked at auxiliary transformers there are fire areas for each of the, normal auxiliary transformers has one, the main power transformer has one and the two emergency auxiliary transformers are each separate fire areas.

I was really curious of why the emergency auxiliary transformers are not important to safety. They are the normal power supplies, each to two safety busses. They're probably not safety related, but they are the normal power supplies to two safety busses.

MR. FINLEY: I'm not sure the scope of this but it was just site specific, you know.

MR. RAO: Emergency auxiliary transformers is --

MEMBER STETKAR: It's the emergency auxiliary transformers in particular. I mean they were the most curious. They're less esoteric than, for example, the feedwater system in the turbine building.

MR. FINLEY: What I'm wondering out loud, and I think we need to take an action unless Steve can help, is whether that was covered in the design certification.

MEMBER STETKAR: No, it's in your Table 9B-2.

MR. FINLEY: Okay.

MEMBER STETKAR: It's my understanding the configurations of those transformers and fire protection I think are probably your scope to supply, you know, where you want to place them or something like that. But, anyway, it's in your COL FSAR Table 9B-2 so it's --

MR. FINLEY: So your question is why aren't these classified as --

MEMBER STETKAR: My general question was, you know, how carefully did someone who did this analysis think about things that are, quote/unquote, "important to safety?"

They obviously identified the, quote/unquote, "safety-related" for rooms in the UHS makeup structure but it's not at all clear to me how carefully they thought about it.

Now, what implications that has on the site-specific fire hazards analysis I don't know because these are just some of the tables. Somebody had to look at a fire at each location and make the determination that safe shutdown could be accomplished given a fire in that location.

But just simply those line items and in particular for those two transformers, you know, dismissing them as they're not important to safety seemed pretty curious --

MR. FINLEY: Okay, so we'll take an --

MEMBER STETKAR: -- which raised the question in my mind about how carefully people really thought about that whole process.

MR. FINLEY: Okay. It sounds like sort of an extension of the previous comment on ventilation.

MEMBER STETKAR: It is for a large, you know, as I said, fires in the, there are several locations in the turbine building, there are a few locations in the switchgear building.

Those are also characterized as not housing any equipment that's important to safety and that is directly analogous to the ventilation. These two transformers, though, are a little bit more --

MR. FINLEY: Of concern.

MEMBER STETKAR: -- focused because, indeed, they are the normal power supplies to safety-related busses. I don't know how they're treated in license. They're not safety-related transformers because the line is drawn at the circuit breakers that separate the transformer from the bus. But to say that they're not important to safety is curious.

MR. FINLEY: Okay, so unless you had more to say, we'll have to take that action and clarify --

MR. RAO: It's the broad definition of important to safety versus safety related.

MEMBER STETKAR: Yes.

MR. FINLEY: Okay, and Slide 53 here begins a series of, again, fire protection COL items, first relating to design and procurement document control; second one, instructions, procedures and drawings; third one, control of purchased materials.

So these are all QA aspects of managing the fire protection system and essentially we have commitments in our FSAR that we'll put the proper quality procedures in place to make sure we maintain augmented quality for the documentation for this system.

Slide 54, additional COL items, first relating to changes, deviations from code; second one, change evaluations; third one, reporting; fourth one, modeling.

Again, these are all specific COL items that essentially we make commitments in our FSAR to put the appropriate program in place to make sure we meet the standards required in each case.

CHAIRMAN POWERS: The maintenance of the design basis of fire protection is a failing of just about every plant in America right now. To the extent that you can avoid that I recommend that you do so because it costs a lot of money to reconstitute the licensing basis.

MR. FINLEY: I appreciate that, yes.

CHAIRMAN POWERS: I think it's easier to do nowadays because of computerized documents and things like that.

MR. FINLEY: Yes, yes.

CHAIRMAN POWERS: It was running about a

million dollars a plant to reconstitute the licensing basis for fire protection.

MR. FINLEY: Yes, yes, yes. Slide 55, still on COL items related to fire protection here, safe shutdown procedures for the first three and the fourth one is repair procedures. So, again, we have commitments to put the procedures in place to ensure safe shutdown under fire conditions will be in place.

The last bullet relates to repair. I think we say here consistent with the U.S. EPR FSAR, we don't require repairs to achieve hot or cold shutdown conditions so we don't require procedures in this case. Slide 56 --

MEMBER STETKAR: And it's good. I noted that you explicitly said you're not a self-induced station blackout plant.

MR. FINLEY: Right. That's always a good thing.

MEMBER STETKAR: That's always a good thing.

MR. FINLEY: In Slide 56, still with fire protection here, and this is protection for independent spent fuel storage areas. We don't have that yet. Although long term we will have that, we have not submitted our license application for that so we won't have procedures to address that yet.

And then site-specific information to address Reg Guide 1.189, Regulatory Position C -- oh, nearby facilities. So we do address this through our Appendix 9 Alpha and, well, actually Appendix 9 Alpha is the U.S. EPR FSAR.

We have supplemented that with Appendix 9 Bravo in the RCOLA to provide analysis of site-specific fire hazards so that's how we address this COLA.

Slide 57, okay we're done with fire protection now and this is communication. The first COL item relates to off-site communication.

We don't have the details of this system designed yet but it certainly will be compatible with the on-site communication system. It'll be powered from Class 1E, uninterruptible power supply system so it'll be diesel backed. It will have interfaces with the plant security system and that's addressed in the physical security plan, not in this chapter.

And the emergency notification system will be powered locally, either from safety-related or nonsafety-related power source, having either battery or generator backup. I don't think the details of that have been designed yet.

Slide 58 is still offsite communication. With respect to the emergency notification system, it's routed through this private branch exchange such that we can make multiple outbound calls and we will take advantage of the NRC direct access lines to the federal long distance service for offsite comms too.

Slide 59 is onsite communications. We have to address in the RCOLA the communication system down in the UHS makeup water intake structure.

We'll have multiple systems available to do that, the digital phone system, a PA system, an alarm system, sound-powered phones and also we expect to have a portable wireless communication system for our operators.

And lastly, Slide 60 is a COL item that relates to diesel generator fuel oil and it's just a requirement to have sites that describe site-specific sources of acceptable fuel oil.

I don't think we go into a lot of detail in our FSAR but we do say that we do have multiple sources that could be brought in, either by truck, barge, or air.

We have relationships well established similar to what's established at the Calvert Cliffs Unit 1 and 2 sites now so we'll have multiple options to provide diesel fuel oil if the necessity arises, and that's it for the material. Let me open it up to questions before we close.

CHAIRMAN POWERS: Any additional questions?

MR. FINLEY: Just in summary then, on Slide 62 there were three departures. We expect two of those to go away. The only remaining departure, as you recall, was the keep-fill line which we need to prevent water hammer.

There are no ASLB contentions. We do have 35 COL items. There are 13 confirmatory items identified. Four of those have been incorporated into Revision 9, and nine will be addressed in Revision 10, which should be early next year. There are four SER open items that the staff will discuss. That's all I have.

CHAIRMAN POWERS: All right.

MR. FINLEY: Thank you.

CHAIRMAN POWERS: Any other questions?

MR. FINLEY: Thanks.

CHAIRMAN POWERS: Why don't we go ahead and just take a 15-minute break and then we'll turn to the staff. Great, so we will reassemble at 20 after.

(Whereupon, the foregoing matter went off the record at 2:03 p.m. and went back on the record at 2:19.)

CHAIRMAN POWERS: We've got a quorum. Let's get started.

MR. TAKACS: Okay, good afternoon again, Dr. Powers and Committee members. I'm Mike Takacs, the acting --

CHAIRMAN POWERS: You haven't changed?

MR. TAKACS: I haven't changed. Very boring fellow, you notice that?

MEMBER STETKAR: He's still the acting.

MR. TAKACS: Still the acting lead PM for Calvert COL. I have with me Pete Hearn, the project Chapter 9 lead PM, as well as Larry Wheeler who's going to do the beginning presentation, and Gordon Curran.

And with that, I believe we can just go ahead and turn this tech review over or presentation over to the tech staff now. Larry, you're starting.

MR. WHEELER: Pete was going to start with a little intro.

MR. TAKACS: Oh, I'm sorry. Take that back. Pete Hearn, the --

CHAIRMAN POWERS: You've screwed up already and you've barely even gotten started.

MR. TAKACS: I'll let Surinder know this too.

MR. HEARN: We'll start with Slide 1 and 2. There's a list of reviewers that contributed to the safety evaluation for Chapter 9, the lead PM Surinder

Arora and Mike Takacs who's acting --

MEMBER ARMIJO: Could you speak a little louder? I can't hear you.

MR. HEARN: On the second slide we have a summary of the number of questions asked and the open items that resulted from the review. It has it by each section of Chapter 9 and then the totals at the bottom, 69 questions overall. We had four open items.

On the next slide are the four open items that are left to be closed in the next phase. First one involves ensure the COL information is incorporated in the next COL FSAR revision.

09.02.05-32 is a clarification related to the CFD computer model uncertainties, meteorological conditions and boundary scenarios.

And then there's 09.04.04-4. There's detailed design information on the SWBVS. And, let's see, there's 09.04.03-1 on ITAAC information for the power supplies for the two diesel driven room vent systems.

That brings us to the first technical reviewer, which is Gordon Curran.

MR. CURRAN: Hi. I'm Gordon Curran. I'm the tech reviewer for NRO tech spec branch, and this is relatively straightforward. This is a COL item, an EPR

DCD that requests the applicant to identify that a cask exists, an approved cask for cask loading.

And the scope of applicant is basically to provide the cask and make sure that it connects up to the facility so that they can prove that they have capability to remove spent fuel from the pool.

In response to the COL item, the applicant committed to a test or analysis to demonstrate that the cask actually can be connected, safely connected to the spent fuel cask facility.

The staff finds it reasonable that they committed to providing that cask and demonstrating that it'll actually fit. That's really all I have.

CHAIRMAN POWERS: What constitutes a verification, verify the penetration leak tightness with loading pit filled with water?

MR. CURRAN: That's about it, connect it up to it. You go through the sequence of and the operation of connecting it up to it and make sure that connects and --

CHAIRMAN POWERS: It connects and it doesn't leak that time?

MR. CURRAN: Right.

CHAIRMAN POWERS: Very good. Is there any perturbation on that that should be done to demonstrate that it's going to, any conceivable perturbation on that? I mean it's kind of specified. I mean once you back that kind of robotic vehicle up everything's kind of, you know, if it fits, then everything -- did it fit?

Are there any perturbations that could conceivably arise that might interfere in that fit?

MR. CURRAN: Well, that's one of the reasons why they run a test, to make sure that that doesn't occur. There might be a case where the cask is, I don't know, not balanced properly so --

CHAIRMAN POWERS: Oh, okay.

MR. CURRAN: -- so it could be skewed a little bit.

CHAIRMAN POWERS: Yes.

MR. CURRAN: And it could rub the ceiling. I don't know. I'm just --

CHAIRMAN POWERS: You're just guessing, yes.

MR. CURRAN: Yes.

CHAIRMAN POWERS: Okay. That's essentially what they're going to do. They're going to fit it and, make sure it fits and --

MR. CURRAN: There was one thing in France that they had discussed where they had a hard time balancing the cask and getting it flush and so that's the only thing that I, that's the basis for my --

CHAIRMAN POWERS: At least when they showed us this design and whatnot one of the questions, I think, Dick, you were the one that raised this question, is you get it all in there and something happens, you lose power, something goes wrong and in order to fix it you have to get a guy. Well, there's no room for that guy to get in. How do you fix it?

MR. CURRAN: That's kind of a process question that's probably outside the scope of this particular review. All they have to do is provide the cask and make sure they work or connects up to it.

CHAIRMAN POWERS: They have to have some process for -- if things get interrupted and you cannot complete the automatic stuff, what do you do about it? That has to exist. That's not outside the scope.

MR. CURRAN: Yes, right.

MR. TAKACS: Dr. Powers, you're asking about a manual function override or some aspect of that process?

CHAIRMAN POWERS: Something happens.

MEMBER SKILLMAN: Yes, let me jump in. This is --

CHAIRMAN POWERS: Yes, I mean, it was your story. You're the one that spotted this.

MEMBER SKILLMAN: Yes, this hydraulic connection from the base of this water column introduces issues of draining that portion of the fuel transfer canal that is contained in that single fuel assembly, issues of draining on the floor and having water running all over the floor.

And if the fuel assembly is a weeper or a leaker, you now have a source term, predominantly cesium-137, if you run this fuel for any length. And so with a slight misalignment or a goof on the locking system, you now have --

MR. CURRAN: Which locking system are you referring to?

MEMBER SKILLMAN: To lock the cask up on the bottom of the transfer.

MR. CURRAN: Okay.

MEMBER SKILLMAN: You've got a real problem. You've got a situation where you've lost water inventory. You may have a fuel assembly that's partially inserted into the cask. You may have a misalignment problem.

And the question that I was asking several months ago was what do you do? And it would seem to me that that would have been an area of focus for the NRC staff.

What is the backup plan if this elegant automatic machine somehow is misaligned, it's off by several degrees or its X and Y axes are not made up precisely where they need to be such that you now have an anomalous situation and you've got to manually approach it? What do you do?

MR. CURRAN: Well, you would have a leak-tight connection before you actually move fuel into the cask.

MEMBER SKILLMAN: You would hope you would, but if you're in midstream and it begins to weep what do you do?

MR. CURRAN: Then you would have to move that element back into the pool or down into the cask.

CHAIRMAN POWERS: I think a more interesting one is who's getting in there? Everything's fine, but now something breaks.

MEMBER SKILLMAN: It won't work.

CHAIRMAN POWERS: It's stuck there and the only way to address it is to have somebody go in there and hit it with a tool or something. I don't know what it is.

MEMBER SKILLMAN: I'll give you an example. I was involved in a removal of the reactor vessel head and the head was on the pendant and the pendant was over the fuel transfer canal and the break on the hoist failed and the head was wreathing down and it was moving slowly.

So the question was where do you put this 156-ton machine so you don't fill the floor of the fuel pool? That's the scenario that I see in my mind. Here you have this very complicated machine, highly engineered, it's very elegant, it's supposed to work, it's probably been tested, but something goes wrong.

What interrogation has the NRC staff done to question that, to make sure that this design really is one that you all would want to put your stamp of approval on?

MR. CURRAN: We've discussed this in detail with AREVA, their design and their backup plan if something goes wrong with this.

They've indicated that there's a makeup that would make up for the worst case that they've analyzed, leakage for when the cask actually, if there was an event, there's a leakage of a seal of, I think, I don't know exactly what they analyze. Raul might know.

But there's dual seals around almost all interfaces between the system and the cask and there's a leak detection in between so if they had a leakage they would have a leakage light in their control room and they would be able to do something like close the lid and move the fuel element that's en route or placed wherever, either down into the cask or back into the spent fuel pool and close the gate so that you're in a safe configuration, I mean relatively.

It would be no different than having in the spent fuel pool, having a fuel element that you have halfway in a rack. Granted, it's not going to be draining down, but you have makeup so your draining down is going to be similar to the spent fuel pool. You're not going to uncover the fuel element that's actually there.

MEMBER SKILLMAN: Shouldn't. It depends on how great the leak is between the cask and the --

MR. CURRAN: That's true and that's why I said the makeup exceeds the leak rate --

MEMBER SKILLMAN: Expected leakage rate?

MR. CURRAN: Yes. We have an audit that we're going to make sure that that actually is the case because we have two values from AREVA. Once they gave us, I don't know, 400 leakage and then they told you guys 250 or something like that. So we're going to audit that value to make sure it's acceptable.

MEMBER SKILLMAN: Are you comfortable, Gordon, that you've done enough due diligence to confirm that you're comfortable with this new design? This is a not-proven design in this country.

MR. CURRAN: That's right.

MEMBER SKILLMAN: Are you comfortable that you've done enough review?

MR. CURRAN: At this point, yes. From what I've seen so far, yes.

MEMBER ARMIJO: Is there a recovery procedure for the kind of event that Mr. Skillman is talking about? There must be. You know, I don't know. Can't imagine there wouldn't be.

MR. CURRAN: Yes, there would have to be. We don't have one to date, but I would assume it would be in their operating procedures.

MEMBER ARMIJO: Wouldn't that be an AREVA document or a licensee document, let's say the French licensee or --

MR. CURRAN: It would be an applicant document I believe, but it would be --

MEMBER SKILLMAN: Have you asked for one?

MR. CURRAN: I have not, no. That specific one, but --

MEMBER SKILLMAN: Should you?

MR. CURRAN: The operating procedures would be part of the heavy load handling where they have all the, what you saw earlier, where they had all the procedures and training and operator training and stuff like that. I have no problem having them put a COL in there to make sure they have emergency procedures.

MEMBER ARMIJO: Yes, recover from the unusual event that, and it may exist and we just haven't --

MR. CURRAN: I don't believe so, that specific anyway.

MEMBER ARMIJO: Yes.

MR. HERNANDEZ: Excuse me. I'm Raul Hernandez, the reviewer for this plant. I look into the different areas and the barrier.

All the, I don't want to call them pressure-retaining barriers. But all the surfaces of the machine has been classified as a seismic 1 component. There are dual seals with leakage indication in between the seals at different stages, including at the connection point between the machine and the cask.

And so we evaluated several different scenarios and in the scenario that you're mentioning, you know, when you are in the middle of a loading if something happened, prior to opening the gates that separate the machine with the spent fuel pool, there's a series of tests that they've got to go through with.

And one of them is verifying that you don't have leakage anywhere, that you have proper alignment, proper connections and you are checking that all the seals are properly working as you go up and filling up a cavity.

Then you open the bottom gate that connects the machine with the fuel cavity and you also verify leakage there before you open the spent fuel pool gates and initiate your loading of the cask.

Like Gordon already mentioned, we look into different scenarios and without postulating a failure of a major seismic test, all those overload, expected leakage rates, it's within the capability of the makeup system.

MEMBER SKILLMAN: Have you considered what can go wrong?

MR. HERNANDEZ: Can you be a little more specific? Because we looked into it and I went through the procedures of the connection and I asked what would happen, you know, at different stages of the process and then all you're doing, the series of tests prior to opening the gates to make sure that you've got a proper seal and leakage prevention.

If a component fails after it's connected, it's not like the whole, the connection is not going to separate. You're not going to have a 2.5-meter opening at the bottom of the cask. You're going to have a small opening that is not going to be beyond the makeup capability.

And in that case, then they would move back the fuel assembly to a safe location. It may be back into the pool or it may be inside the cask, depending on where they are in the moving process.

We looked into different components and, like I said before, all the components that could cause a large failure would be seismic core components.

MEMBER SKILLMAN: I guess I'm just pushing back from the perspective that you're very comfortable that this is highly engineered, highly precise, going to work exactly as planned and it probably will, but what if it doesn't? What's different here is you've got gravity working against you. It's going to try to uncover that fuel assembly.

Let's say the grapple in the fuel assembly fails and the fuel assembly is now caught. What do you do? I would just suggest that there needs to be some serious front-load thinking about what do you do when things go wrong, particularly with this new design.

Let's go to a present licensed plant. You drop a fuel assembly, we know what to do. If you drop a fuel assembly into a rack, we know what to do. If you load a fuel assembly into the cask, pull the cask over into probably your transportation bay, to your railroad car, to your truck, we know what to do.

I hope that between AREVA and the licensee they'd follow through what do we do if this doesn't work, if this doesn't function as precisely as we intend it to?

This is a new design. We haven't seen it in this country. Experience would tell us we're going to have some surprises. Hopefully they're not significant. Hopefully it doesn't result in a release.

But at least we ought to be thinking that way. I think Rule 1 in nuclear is what can go wrong? What are the barriers? What can you do?

And it seems to me that this is one of those situations where we should be abundantly curious, not skeptical or cynical but really aware that this is a new machine and we really haven't tested it.

We don't have experience with it and we ought to be doggone sure we're not going to drop a fuel assembly, have one get caught, have the grapple do something that we hadn't anticipated and end up with actually a plant that's stuck because you can't get near the fuel assembly.

Yes, I can tell you in the campaigns I've been involved in a fuel assembly's worth 250,000 R per hour. If you get them nearly uncovered, it's very difficult to get near them, to grab them, to place them, whatever it is. So I've got some experience with this stuff and I'm thinking we better be real careful with this.

MR. CURRAN: I agree.

MEMBER SKILLMAN: So my challenge to you is have you queried that enough so that you are comfortable with what is being proposed?

MR. CURRAN: We've queried AREVA pretty extensively on what could go wrong and what features they have to ensure that nothing like this or no failure does go wrong.

We've asked them the exact question you're asking about a dangling assembly, if it starts draining down and you have an assembly. Unfortunately I can't recall exactly what they said but --

MEMBER STETKAR: I think they said, if I recall, they'd pick it up and they'd put it back in the pool. I believe that's what we heard.

MR. CURRAN: I think you're right, either put it in the pool or put it into the cask.

MEMBER SKILLMAN: But it's picking it that's the trick. You have got to get it somehow. It's tough.

MR. CURRAN: Picking. You mean if it drops?

MEMBER SKILLMAN: Somehow you got to grasp the assembly.

MR. CURRAN: I was referring to if you had it in the grapple already and you were lowering and for some reason it gets stuck. It's halfway in the cask. That would be the case --

MEMBER ARMIJO: If you're carrying it and you drop the assembly, you would never let go of it until it's in the cask, you would hope. So you would know the thing was leaking when you opened the big gate.

MR. CURRAN: Know that the --

MEMBER ARMIJO: Seal was leaking.

MR. CURRAN: The seal was leaking.

MEMBER ARMIJO: Yes.

MR. CURRAN: You do have a seal leak detection system so you will know the seal is leaking or not. And to protect the bellows that are in between there they have a shield for just that case, if you drop an assembly, to protect the bellows from leakage.

CHAIRMAN POWERS: My impression was then all those operations were well thought out and had been tested extensively by experience in France.

MR. CURRAN: Yes.

CHAIRMAN POWERS: The question that got posed that I really came away saying I'm not sure we have a good answer is after you've done everything, you've got a cask in there, whatever, the thing cannot be moved back out. It's stuck.

MR. CURRAN: What is stuck? The cask or the --

CHAIRMAN POWERS: The carrier.

MR. CURRAN: Okay.

CHAIRMAN POWERS: And, I mean, there's no clearance. In the tunnel going in there, there's no clearance and there didn't seem to be a man way to get in. How do you fix it?

MEMBER SKILLMAN: It actually locks itself in place. That's part of your seismic design. That is the assurance that the cask trolley and the building are unified, and that's good.

What happens when something goes wrong, and I'm not trying to be cynical. I'm just saying have you really thought it through or have you requested the licensee to give you some assurance that there is going to be a backup plan, some kind of a procedure or at least a thought process so that if things do go wrong there is assurance that they will be successful in how they pursue this.

MR. CURRAN: Right. Well, I intend to question them, to add a COL item for a procedure just like you're talking about. In case something goes wrong, for them to have one in place, an emergency procedure of some sort on how they address and how they address access of a human into the facility.

I do know that they can somehow get in there, though, because in France they had a situation where I think they put the wrong element into the cask and then they couldn't straighten it out in order to get the lid back on the cask, the biological lid station.

So what they had to do is move it back somehow to the penetration assembly and offload all the elements and in the meantime it was so hot that the water was coming over the side of the cask.

MEMBER ARMIJO: That's the sort of thing we're --

(Crosstalk)

MEMBER ARMIJO: That's exactly the sort of thing we're, you know, something goes wrong that shouldn't and is there a --

MR. CURRAN: This was the only one that France had brought up to us that we actually, you know, that we know about.

CHAIRMAN POWERS: Whatever they did may

explain then what gets done but nobody's ever acquainted us with it, so to the extent you can help us out I would really appreciate it.

MR. CURRAN: Okay. What they did is they backed it up. They pulled the lid. They didn't put the lid on because it wasn't --

CHAIRMAN POWERS: They couldn't do it, yes.

MR. CURRAN: -- balanced, yes. So they just backed it up, offloaded it and cleaned up I'm assuming.

CHAIRMAN POWERS: Thank you, good.

MEMBER SKILLMAN: Thank you, Mr. Chairman.

CHAIRMAN POWERS: Yes. I sure got a kick out of seeing it but, I mean, you raised a good point. The best-laid plans of mice and men oft gain annuity as they say. Actually Stetkar says that. I don't.

MEMBER STETKAR: I can't pronounce those words so you can't blame that on me.

CHAIRMAN POWERS: You have a hard time pronouncing most words so --

MEMBER STETKAR: Monosyllables and grunts are about all I can manage most of the time.

CHAIRMAN POWERS: Let's continue on.

MR. WHEELER: Good afternoon. My name's Larry Wheeler, NRO, technical reviewer for balance of plant.

On this next slide, these are the open items. We will talk a little bit further on these open items, RAI 393 and 398. Next slide.

Now, UniStar did such a good job of talking about the COL information items, they kind of duplicated my slides so I'll kind of hit the highlights.

CHAIRMAN POWERS: That's fine.

MR. WHEELER: And fill in some of the blanks that I had in my slides that they may not have covered. So for the ESW system, COL information item 9.2-4, this is dealing with materials. Piping's carbon steel. They're --

CHAIRMAN POWERS: Did you jump over a slide?

MR. WHEELER: -- currently designed for 60 years. I'm sorry?

CHAIRMAN POWERS: Did you jump over a slide or did I blank out?

MR. WHEELER: The slide right before this is just the open items.

CHAIRMAN POWERS: Oh, okay. I have 9.2.1 and that seems to be right.

MEMBER SKILLMAN: I think you back up one, you'll find, there you go.

CHAIRMAN POWERS: There we go. That's --

MR. WHEELER: No, let's go back even further. There we are. So like I said, COL information 9.2-4, this is materials for the ESW system. Compatibility, once again we're talking about carbon steel. It's designed for a 60-year life against corrosion.

One of the RAI responses they gave me, they did go on and say that the corrosion allowance is 0.24 inches, so it's almost a quarter of an inch for 60 years.

Buried piping, again internally lined, external coatings, cathodic protection, points to FSAR 8.3.

CHAIRMAN POWERS: I would not expect you to know, but I'll ask anyway.

MR. WHEELER: Go ahead.

CHAIRMAN POWERS: Do you happen to know what kind of epoxy they're using?

MR. WHEELER: I think in the RAI responses it was in very general terms. I didn't think that it kind of specified what those materials were.

CHAIRMAN POWERS: It's going to be a kind of epoxy.

MR. WHEELER: Yes.

CHAIRMAN POWERS: Yes. That's fine.

MR. WHEELER: One thing that I did see in an RAI response, they gave me the ASTM number for the internal coatings. If that's important to you, I'll spit it out. If it's not, I'll just move on.

CHAIRMAN POWERS: You could spit out any number you wanted to and I would say, oh, okay, yes.

MR. WHEELER: It's ASTM Charlie 150 if that matters to you, so. The most important thing here, at least on the COL information items, is the staff's finding and what we're saying, it meets all applicable GDCs.

And what we're talking about, in all these future slides we're talking about GDC 2, 4, 5, 44, 45, 46 and we also balance this against the guidance criteria in the Reg Guide 127 and SRP 9.2.1 and 9.2.5. We also looked at ITAAC and we also looked at 20.1406 contamination.

CHAIRMAN POWERS: Do we have an experiential base with this kind of buried piping?

MR. WHEELER: I'm sorry, say that again.

CHAIRMAN POWERS: Do we have an experiential base with this kind of buried piping? In other words, you know, with all our plants, do they have this kind of piping?

MR. WHEELER: Well, I can say from

experience, I worked at Surry. Surry is on the James River, brackish water, and it was not coated. It was carbon steel pipe.

And they got licensed in '72 and I was there, you know, five/six years ago and we were constantly fighting pinhole leaks in the service water pipe, safety-related service water pipe and circ water line pipe.

So we know what this type of water chemistry is going to do carbon steel pipe so anything above carbon steel pipe, like cathodic protection, external coatings, internal coatings, has got to be a significant improvement than what we licensed back in the '70s.

CHAIRMAN POWERS: That I'm sure of. Okay, let's go ahead.

MR. WHEELER: Now, I can certainly go into the INPO database or even NRC database and pull some information together and look at this type of material and see what kind of failures there are from a maintenance role standpoint but, like I said, this is by far an improvement based on what we've licensed years ago.

MEMBER STETKAR: There's been a lot of attention paid to specifically carbon steel, like buried carbon steel piping, in the license renewal process. That's a big issue at many plants.

CHAIRMAN POWERS: No kidding?

MR. WHEELER: EPRI has --

MEMBER STETKAR: I wouldn't kid you.

CHAIRMAN POWERS: Well, I mean my question really is do we have other people using them and know something about this? The problem, of course, is whatever epoxy coating got used is not the epoxy coating you can buy today and so some of that experience base is --

MEMBER STETKAR: Well, in a lot of that, I'm not sure that a lot of the currently operating plants, I can't say this with certainty, actually had epoxy coating. It tends to be wrapped, you know, traditional --

CHAIRMAN POWERS: Wrapped, yes, sure.

MR. WHEELER: Yes. I do know that INPO, not INPO, EPRI has a working group on buried piping. I attended one of their meetings and the industry as a whole is well aware of the issues that are out there.

And it looks like UniStar is going down the right path by just not putting carbon steel in the ground, not coating it, not internally coating it. You know, they are taking some steps. They've got the corrosion margin, a quarter inch, so I think they're going down the right path.

If we could move on to the next slide. This is COL information item 9.2-1. This is on the ultimate heat sink. Of course, as UniStar talked about, there's two means of getting water to the cooling towers.

They've got the normal makeup which is nonsafety. It does have safety-related isolation valves. This normal makeup system, valves do isolate on safety injection signals.

The other water makeup system is, of course, we talked about the emergency ultimate heat sink makeup system. This equipment is actually in a safety-related Seismic Cat. I Structure down by the Chesapeake Bay. We've got two buried safety-related 60-inch diameter pipes that are bringing water in from the Chesapeake Bay into the water intake structure.

It's estimated the emergency flow from the Chesapeake Bay is on the 92 to 1,500 gpm so we're not talking about a lot of flow coming from the Chesapeake during emergency conditions. Of course, the safety-related makeup system's designed post-DBA starting at day 3 out to day 30 so about 27 days.

The ultimate system makeups or emergency makeup system does have four safety-related pumps, has four safety-related strainers, four safety-related traveling screens, four safety-related screen wash, so we've got four of each because of the four cooling towers.

The ultimate heat sink makeup pumps were evaluated for NPSH. The pumps' self-cleaning strainers, valves are all safety related, powered with Class 1E. Talked about the pumps are mainly started from the control room post-DBA plus 72 hours.

Freeze protection is addressed with safety-related heaters that are actually in the pumphouse and the traveling screens are in those rooms with the safety-related heaters. And kind of a defense in depth, there's nonsafety heat tracing. That's actually on the bar screens down at the pumphouse.

So NPSH, it looks like we are looking for about 7.2 feet and we've got available 40 feet, so we've got lots of margin there for NPSH. Next slide, please.

MEMBER STETKAR: Larry, just for --

MR. WHEELER: Yes, go ahead.

MEMBER STETKAR: For the record, during the break it's the staff's understanding that, indeed, the I'll call it isolation valve, I'm not sure what to call it, from the makeup system in the ESWS basin area, I don't know if it's inside or outside, is throttled automatically to control levels. You showed me information that you had on this.

MR. WHEELER: The ultimate heat sink makeup system, once pumps are turned on manually there's a valve that cycles based on sense level in the ESW basin and that is described in my SER. If you need that valve number, it is --

MEMBER STETKAR: No, I know which valve we're talking about. It's the valve at the basin, not the valve down in the --

MR. WHEELER: C021 valve. That's the throttle valve.

MEMBER STETKAR: The one that comes open automatically.

MR. WHEELER: Yes.

MEMBER STETKAR: That seemed to be different from what I thought I heard UniStar saying today so we need to make sure that that's consistent.

MR. WHEELER: Okay, if it's okay to move on, we're still in 9.2-5 ultimate heat sink. This is COL information item 9.2-5. This is the materials used for the ultimate heat sink are appropriate for the site location. And as UniStar had said, and I'm not going to really repeat anything here, the staff's finding here is it meets all applicable GDCs.

The next slide is related to ultimate heat sink, COL information 9.2-6. This is confirm that the highest average site wet bulb and dry bulb temperature over 72 hours is bounded by the values in the EPR DC.

And in this case there is a 100 percent match between EPR and the Calvert Cliffs and, once again, it meets all applicable GDCs.

Moving on to the next slide, ultimate heat sink again, COL information 9.2-7. This is confirm the site-characteristic sums of 0 percent exceedance maximum non-coincident wet bulb temperature and site-specific wet bulb correction factors did not exceed 81 degrees. Otherwise, confirm that the cold water return temperature is less than 95 degrees.

So this is where we get into the cooling tower interference and recirculation, and what we had looked at was the data that came from the Naval Air Station determined that the wet bulb temperature is 85.3.

There is a correction factor. That was analyzed using the CFD runs, and through the analysis that was done, they had determined that it's less than 2.5 wet bulb related to interference and recirculation.

So that brings the correction in non-coincident wet bulb up to 87.8. So based on the cooling tower analysis, maximum cold water return temperature was determined to be less than 95.

And if you turn to the next page, we kind of get into a little bit of discussions of why this is an open item.

The staff wrote an RAI 298 about six, maybe eight weeks ago, and what we had received from UniStar up to that point was -- an earlier RAI talks about this analysis that went in to determine the cooling tower plume interaction.

And the RAI that came in we felt had a lot of holes that we needed to have questions resolved so that's why we wrote this RAI. There's about 20 subparts to this RAI and a lot of it was the uncertainties of the model.

At that point that we wrote the RAI, we did not have the audit. We've had the audit since, so we've had our staff actually go to meet with UniStar and Bechtel and AREVA to review their CFD model.

We walked away from that audit thinking that Bechtel and UniStar had did a tremendous amount of work to the number of runs that they had done, somewhere in the 50-plus range of models.

And we kind of walked out of there thinking that they might not have zeroed in on coming up with the peak number for wet bulb.

The AREVA number that they needed to stay under was 2.5 and they are in the neighborhood of 2.1/2.2 and we asked them how many times did they slice and dice the compass, the 360-degree compass, and the answer was 16 times. So they had 22-1/2 degree slices and they looked at wind speed at five meters per second and ten meters per second.

Then we said, well, what about six meters per second, what about nine meters per second? How do you know you really zeroed in on the right number? How do we know for certain that that 2.5 number is correct?

So since then, UniStar and Bechtel and AREVA have gone back and sharpened their pencils. They came up with a confirmation that they are still below 2.5.

And I'm not quite sure, I'll have to ask Bechtel how many runs did you finally do to end up getting down to the number of less than 2.5? Do you remember?

MR. RAO: Shankar. We have about five different cases where we had looked at some angles specifically because of the angle was more of a concern from our CFD experts from NRC.

And a five-degree increment angle of both sides of the angle we had before and we have established that the angles were where we get the peak and then the thesis again was established. That's where we have indicated that it went up a notch but it's still less than 2-1/2.

MR. WHEELER: The reason I wanted to ask

Bechtel that question here is we just got an RAI response in this morning on this 20-subpart question and I really haven't had time to digest it and didn't know how many more runs that they did.

But still, you know, give us some time to look over the RAI but the important thing is it sounds like the RAI response is still indicating they're below the EPR value of 2.5, but give the staff some time to look over that RAI response.

CHAIRMAN POWERS: That all proceeds under the presumption that the CFD model is, in fact, an adequate model of the flow field around these things. You're using Fluent or something like that?

MR. WHEELER: We have an expert from research that might --

CHAIRMAN POWERS: I know and I wanted to give him the floor.

(Laughter)

MR. WHEELER: That had gone to the audit with us because I myself was nowhere close to understanding what was going on, so Christopher had gone with us on the audit and he might have some good information to help you understand.

MR. VAN WERT: We did go down. We were happy to see that there was a lot more than was initially, I guess, reported to us. So we went down with the concerns about, you know, was the mesh adequate, did you do any sensitivities, things like that.

What we found in general was there was a V&V document that kind of laid out some of the basis for the turbulence selection, the wall modeling approach, and that's a positive thing so there was a basis. Of course, there's always uncertainty with these things.

The V&V document, for instance, looked at wakes behind structures. They went up to a six-meter cube in a field. They did a read and on the basis of several scales they picked that. There was also some good sensitivities that we saw which, again, reduces the uncertainty a little bit.

The other thing in general is given the number of runs overall that were completed, this number is not super-sensitive.

So in other words, if your number is 2.3, you don't get a 10. You know, so if the limit is 2.5, you know, there is uncertainty. It's not quantified, or at least I didn't see it.

But it's reasonable, and I think in the bigger picture I was happy to see that they did a reasonable job and some due diligence and then these peak values come from a maximum heat load with a worst-case temperature and worst case wind angle.

We had argued that maybe you didn't find that worst case wind angle if you're only looking at 22-1/2 degree increments. But given all of that and looking at the big picture, we felt it was a reasonable --

CHAIRMAN POWERS: Well, I mean what you're telling me is they did a professional job with the tool.

MR. VAN WERT: That's right. It's a 600 meter high domain so, of course, they didn't use 1 cm cells to do all that kind of stuff.

CHAIRMAN POWERS: Exactly, yes, right. And the question comes, I mean I guess there are a couple questions that come to my mind. One of them I think you hit upon is if I'm looking at a 2.5 limit, is my tool any good for telling me the difference between 2.3 and 2.5? Probably, maybe.

The other question is do we know that in this kind of calculation this particular computational tool, which I assume is Fluent but I don't know that for a fact.

MR. VAN WERT: They used the STAR-CCM+.

CHAIRMAN POWERS: STAR-CCM, okay. Do we have some confidence this tool is any good for this analysis?

MR. VAN WERT: I get asked that question a lot and, in my opinion, no tool is good enough for this analysis because it's not good enough until you demonstrate it.

So in other words, if the tool was good enough, that's not enough and there's plenty of tools that aren't good enough but it's a matter of the due diligence up front to demonstrate that it's good enough.

So the STAR-CCM+ is, you know, it's kind of industry standard, what you may call state of the art. It has all of the physics that would be appropriate for this case.

That doesn't mean that as a model it's good enough. So there's no limitation in the tools they used, I guess, if that answers your question.

CHAIRMAN POWERS: I think I know what you're saying, is that they've done the obvious things to qualify their answer, okay. What we don't know is, as you say, is any tool good enough to give us what we're after here and I guess that's still an open question.

MR. VAN WERT: You know, the tools have been demonstrated to, you know, it balances mass and energy and things like that and some of their benchmarking focused on can we calculate the recirculation zone, the reattachment point behind large structures?

Now, none of the benchmarks have a variety of structures and wakes that one building hitting another building in this multidimensional way kind of phenomena that you see on a complex plant layout like this. And then, you know, test data like that aren't readily available of course.

But for the available, what you could do, they demonstrated that they could calculate these kind of recirculation zones and kind of the volume of that zone was reasonable.

CHAIRMAN POWERS: Okay, okay.

MR. VAN WERT: So is there uncertainty? Yes, but given the number of sensitivity studies that they did you sort of get at least a feel, and this parameter is not a parameter that jumps around drastically. Now, if we were looking at, you know, velocity somewhere, that would be all over the map.

CHAIRMAN POWERS: Yes, yes.

MR. VAN WERT: But given this integrated parameter of this wet bulb temperature --

CHAIRMAN POWERS: Okay. Okay, I understand. Good, good. Thanks, Chris.

MR. WHEELER: Keep in mind that wet bulb cycles from January to January and peaks in July, August and September and daily it peaks between noon and 3:00.

So you're almost talking about, like, the perfect storm for this type of event to occur where you start with four cooling towers, you take one out of service, you take the single failure on two, you have the DBA in the middle of summer at 2:00 in the afternoon is where this analysis is going to focus on whether my return temperature back to the plant is greater than 95.

Of course, after a DBA your heat load drops off fairly quickly. So as you approach 95 degrees, maybe going back in the plant because you're 2:00 or 3:00 in the afternoon with the right wind direction, the correct speed, the 95 is going to go below 95 as the heat load drops off.

So just kind of keep that in perspective, right? This is the perfect storm where all those things have to line up where we kind of get ourselves into potentially going above 95.

Okay, if I can move on to the next slide, this is 9.2-5, COL information 9.2-8. This gets into the makeup capacity related to the 72 hours and similar type of sliding UniStar gave us.

We need pumps greater than 300 gpm. They are giving us 750 gpm pumps, even though if you get into this intermittent traveling screen wash, you know, the margins we're talking, over 200 gpm with sprays on and 450 with sprays off. And once again, staff's finding, it meets the GDCs. Next slide.

MEMBER STETKAR: Larry, before you --

MR. WHEELER: Yes, go ahead.

MEMBER STETKAR: Before you leave that slide, there's a section in the SER that is only in the SER. It's not addressed in the FSAR regarding makeup water support for the dedicated essential service water pump.

MR. WHEELER: Yes, that's on division four?

MEMBER STETKAR: Yes, and there are several statements in the SER that seem curious. I understand that the dedicated ESW pump has lower net positive suction head requirements so, therefore, you can allow level to go lower in the basin.

But there are statements that say things to the extent, that says, "Makeup water to the Train 4 UHS tower would not be necessary for well beyond 72 hours as the heat load during this event is low compared to a DBA." What's the basis for that statement?

MR. WHEELER: Yes, I see where it is.

MEMBER STETKAR: It's the middle of the third paragraph. As you just mentioned earlier, the design basis accident heat load is based on the fact that two of the normal essential service water trains are operating.

So, therefore, half of the design basis accident heat load is going through each train. The dedicated pump train takes all of containment heat whenever it's aligned and provides enough cooling so that you don't fail the containment.

And it's not clear to me that that heat load is less than the design basis accident heat load, nor is it clear to me that that heat load is applied by definition more than 72 hours after the initiating event occurs because this is a severe accident. It's a core melt.

MR. WHEELER: Right. That's right.

MEMBER STETKAR: It happens when it happens. It might happen a very few hours after the initiating event.

So I was curious about the arguments regarding timing and heat load. I will grant you that you can let level get lower before you need to makeup. Certainly the makeup capacity is more than enough. Five hundred gallons is more than enough to take away decay heat, you know.

But the timing, you know, do the operators necessarily need to wait as long as 72 hours before they start the makeup? It's not clear to me. They might need to start it earlier.

Now, this is all beyond design basis. It's only for severe accidents so it's not clear that it's part of the licensing basis.

But as long as it's addressed in the SER, it's not clear to me that the rationale necessarily holds together. It's not clear to me that it doesn't, but just I don't understand the severe accident well enough. Dr. Powers understands these things much better than I do.

CHAIRMAN POWERS: Severe accidents, nobody understands them very well.

MEMBER STETKAR: But if anyone understands them, you do.

CHAIRMAN POWERS: There are a great number of specialists in the field of severe accidents. There are no experts.

MEMBER STETKAR: Anyway --

MR. WHEELER: I see the statement and --

MEMBER STETKAR: It is but because it is a succinct statement I was a bit curious about it.

MR. WHEELER: And all I can remember from when I wrote this is the severe accident, when you actually put that pump into service is way beyond 72 hours.

MEMBER STETKAR: How do we know that? I'll take away all decay heat removal. How do I know that if

I don't have a lot of heat input to the containment --

MR. WHEELER: Well, beyond design basis, that means everything has failed, right? Everything.

MEMBER STETKAR: Well, that's a different issue. I mean you have to at least have some electric power.

MR. WHEELER: Everything has failed. That means you have no heat sink. That means I've lost everything.

MEMBER STETKAR: There are some conceptual disconnects between why this thing is powered from Train 4 but I guarantee you, I'm a PRA guy, I can dream up a scenario where you can actually get electricity to this thing during core melt accident when nothing else is running.

Frequency, you know, of that I'm not going to try to speculate but it's not clear to me that the heat load, because it is a severe accident, would always, by definition, be after 72 hours.

There may be other arguments to justify that this is okay. It's just I'm not quite comfortable with this.

CHAIRMAN POWERS: I mean it's not required to be licensed to severe accidents.

MEMBER STETKAR: That's true. This issue

is not addressed in the COL FSAR. It is not. It is strictly addressed in the SER. It's the only reference to this issue that exists in the written --

MR. WHEELER: I thought it needed to be addressed, so that's why it's in the SER and maybe I need to go back and validate my references and come see you or --

MEMBER STETKAR: That would help or, you know, when we get into Phase 4 see what the SER says then. I don't know how you want to do this.

CHAIRMAN POWERS: Well, to the extent --

MR. WHEELER: It's possible --

MEMBER STETKAR: Or between now and December. I mean, you know, we're going to revisit, theoretically, this except we don't have much time in December.

CHAIRMAN POWERS: Our going-in position was that these open items exist and our decision to move from Phase 3 to Phase 4 is motivated on the committee has not identified anything that the staff has missed and needs to do more on it before we make that move. I don't think that falls in this category. It's an issue that has to be resolved prior to going from Phase 5 to final.

MR. WHEELER: It is possible I might have got that information from an earlier RAI that I did not put the RAI number down so I may verify my reference.

MEMBER STETKAR: Okay. How we close the loop is a matter of process. It's not --

CHAIRMAN POWERS: Yes, I mean anyway we can do so, whatever's easiest.

MR. WHEELER: So I think I completed my COL information 9.2-8 that we're talking about the pumps and the flows.

Moving on, COL information item 9.2-9, still talking about 9.2-5. This is pretty much a duplicate to the UniStar slide, the chemical treatment, reduce scaling and corrosion.

The cooling tower's designed for initial TDS of 5,000 ppm. During the post-DBA, the TDS concentrations can reach as high as 72,000 which is about 14 times that original design value.

Thermal performance at cooling towers was performed by a cooling tower vendor. They determined, based on the decline in the heat load, that the water return temperature would still be below 95 degrees.

This was determined to be an open item because what I was looking for was an ITAAC, site-specific ITAAC, and UniStar and I went back and forth on whether it's a site-specific ITAAC or it could be an existing EPR ITAAC.

And they have given me an RAI response and said that I think the EPR ITAAC item 7.9 resolves that and I'm looking at that RAI response. I would say it looks favorable. I haven't decided for sure if that closes it out but I think we're on a success path.

Moving on to the next slide. Once again, FSAR 9.2.5, information item 9.2-10. This gets into the cooling tower interactions between what comes off the plume and the safety-related intakes.

We looked at the main control room, the safeguards building ventilation, emergency power generation ventilation, combustion air in the diesels, essential service water pumphouse ventilation.

And looking at the CFD model, some of the margins that we saw related to main control room safeguards. Staff finds that that's been adequately addressed.

However, we wanted to keep this still as an open item because of the open RAI that discussed the CFD uncertainties that we still need to look at.

And next slide, once again still on 9.2.5, COL information 9.2-11, confirm that the maximum ultimate heat sink cooling tower return temperature of 95 degrees is met.

This is a duplicate to the UniStar

presentation that the peak heat loads and the peak wet bulb temperature together, the cold water return still did not exceed 95 degrees.

The EPR value on that table, the peak wet bulb was at between nine and ten hours and UniStar proposed to back that up to the three to four hours of the DBA and that seemed reasonable to align the peak heat load of the DBA and the peak wet bulb, you know, on the same timeline.

So there is an ITAAC that is going to cover that. I think the cooling towers are capable of removing design heat load without exceeding the return temperature of 95 degrees. Now, once again, this all meets the applicable GDCs. So that ends 9.2.5.

We're going to move off to 9.2.9, raw water system, COL information item 9.2-3 plus conceptual design.

As UniStar had mentioned, the raw water draws water from the Chesapeake Bay. This is untreated. It's nonsafety function. We've got a couple pumps at 790 gpm each.

The worst type of ESW basin flow that we need is about 1,500 to support the plant cool down and shutdown.

The areas in corrosion-resistant materials and the RAI response says they could use HDPE or fiberglass. That's still something for them to decide as they get into the details.

There is one other thing that we looked at is the staff was concerned about the raw water line shearing off before it goes into the cooling tower basin.

And we looked at that and the response that came in from UniStar said that the pipe anchor, the interface at the concrete structure, is essentially going to keep the raw water or pipe break water from actually entering into the cooling tower basin, so we were comfortable with that. And that ends 9.2.9. Once again, the staff finds it meets applicable GDCs. And I am finished.

MR. TAKACS: Raj, you're going to come up now for your part.

MR. GOEL: I reviewed this Section 9.4, air conditioning, heating, cooling and ventilation system, Section 9.4.

It has 16 subsections and 13 of them are the IBR. They are site related and one is the line building and switchgear, the line building ventilation system, another of this makeup water. Makeup water building structure, ventilation system and otherwise is fire protection building water ventilation system.

And there are two open items, RAI 382 is about open item 9.4-2 regarding switchgear building ventilation. The applicant has said the design is not complete, sufficiently complete, and so we send this RAI 382 back to provide this information.

The applicant has provided a markup of the FSAR that is not included so I looked at it. It looked to me okay but we're going to take this --

(Crosstalk)

MEMBER STETKAR: I was going to ask. You preempted me. Thanks.

MR. GOEL: Sorry, it's not closed out item. I have not written. And same thing in this fire protection building. They said they have emergency power supply on loss of outside power but there was no information in the FSAR.

So I wrote the RAI 384 supplying this information of an ITAAC which applicant had provided and in first instance it look okay but we're going to look at more material.

MEMBER STETKAR: One question I had, Raj, and I don't know whether what's in the SER and what's in Revision 9 of the FSAR are out of sync on this.

There's a discussion in the UHS makeup building ventilation system regarding ventilation for the electrical switchgear area. And in the SER there's a long discussion about the fact that the electrical switchgear rooms are below grade and there are no outside air intakes.

As best as I can tell, they're at grade level and there's some outside air intake for them so I wasn't quite sure how the SER matched up with what I can see in the design, and Mark seems to have some information.

MR. FINLEY: So Mark Finley, UniStar, just to interject, Raj. So we did make a change to the structure. I think it was maybe Revision 8 of the COLA, somewhere around there, where we did have prior an electrical building that was essentially underground without ventilation but we changed the structure so Rev 9 has the new structure but maybe the SER does not.

MEMBER STETKAR: The SER apparently hasn't caught up to that because it does talk about below grade, no intake and, okay, that helps. Thanks.

MR. GOEL: I took up in between.

MEMBER STETKAR: Yes. No, that's --

MR. GOEL: So I'm going to look.

MEMBER STETKAR: Occasionally we get caught up with this moving design issues. Thank you.

MR. TAKACS: That brings the technical presentations to a close.

CHAIRMAN POWERS: Okay. Any other questions on any of these matters?

MEMBER STETKAR: Does the staff, who reviewed the fire protection stuff? Do you have your reviewer here?

Okay maybe, because I had a couple questions on the fire protection that are fire-related stuff. And now I don't know what you want to do procedurally, so.

CHAIRMAN POWERS: Procedurally I'm going to go ahead and we'll fill in as we can.

MEMBER STETKAR: Yes.

CHAIRMAN POWERS: Our plan is in December to bring to the full committee discussions of Chapter 2, Section 2.4, hydrologic engineering; 2, 2.5, geotechnical engineering; Chapter 3, design of SSCs except for 3.7, seismic system analysis; Chapter 9, auxiliary systems, we discussed a little bit today; Chapter 13, conduct of operations; and Chapter 14, verification programs ITAAC. Okay, and we intend to do that in two hours.

MS. WEAVER: Two hours, yes, sir.

CHAIRMAN POWERS: Split between the staff and the applicant.

MS. WEAVER: That's correct.

CHAIRMAN POWERS: So this is a modest tour in December. It's very formidable amount of material to try to present to the full committee and so I can implore you on two things.

The applicant in this case should recognize that many on the committee are going to have had episodic exposure to this and they're not going to be completely familiar to the plant and so you're going to have to come in with a little bit of background, explanation of what it all is and present at a fairly high level.

To the staff, let me encourage you in this regard. The committee is going to be relatively disinterested in the number of RAIs that you sent out and whatnot.

They're going to be much more interested in two things, one, what analyses that you have done to validate and verify the claims made by the applicant and especially in the independent and what remains to be done and why it's important.

Those items that are of a bookkeeping nature or formalism nature, Committee's going to be relatively, they can't advise you on those matters. Those that are of a technical or substantive nature should get some emphasis and whatnot.

For instance, the fact that you had Chris Boyd go down and look in detail at their CFD analysis and come away with a reasonable feeling based on his experience, that's a very good thing to acquaint the committee with so that they know, have some feeling for the depth to which you've gone on these matters. That's the biggest advice that I can give you.

A tabulation of we had 600 open items and now we only have 3, it's information I'd put on a slide in the presentation and spend exactly zero time in the presentation. They can read it faster than you can say it and they're not going to be interested.

They are going to be interested in what you have done to verify and validate the claims and they're going to be very interested in what remains to be done.

MR. TAKACS: Dr. Powers, Mike Takacs here. I just want to verify or clarify that second statement, what remains to be done, and maybe some here know what you're referring to specifically, not specifically but is it open items, the issues, what you're concerned --

CHAIRMAN POWERS: Yes, the open items are going to be of interest. They're not going to be interested in those that are of a verification, I mean, of a bookkeeping nature.

MR. TAKACS: Sure.

CHAIRMAN POWERS: Those where you are expecting something from the licensee, how you look at it, how you're going to look at it, they're going to be interested in that.

MR. TAKACS: Got you.

CHAIRMAN POWERS: Okay. Those that say, well, you have to do something in your documentation, there's nothing they can advise you on on that matter.

MR. TAKACS: Right, okay.

CHAIRMAN POWERS: So, you know, they're going to spend zero time thinking about it because there's nothing they can say to you. You know your procedures better than ACRS will ever know them.

But things where you're going to have to look and think about things as professional engineers, they're going to want to know how do you think about these, because many of them are as challenging to the ACRS as they are to you, trust me.

And, again, the applicant here, again, it is far more of interest to the ACRS knowing how you approached these problems and got resolution than it is to know when you submitted and things like that.

And understand many on the committee are not paying attention day-to-day on this. They're involved in other sections, so they'll need a little more background and whatnot on this.

There will be, needless to say, a great deal of interest in, for instance, your hurricane analyses, your tsunami analyses as you well might expect in the aftermath of Fukushima, and so you may want to go into a little more depth on those than other items and whatnot.

And you'll have to make those judgments but, I mean, think from the perspective of someone who has intense technical interest in these things but probably has not plunged into the details. Any other questions you'd like to pass on?

MEMBER ARMIJO: I have a comment.

CHAIRMAN POWERS: Yes, sir.

MEMBER ARMIJO: Yes, well, I recently looked up on the Internet this super austenitic stainless steel, so I think I can save everybody a lot of trouble.

It's really not a stainless steel. More than half of the alloy is not iron and steels are normally iron based, but it is a really good material, very high chromium, very high nickel, high molybdenum and high nitrogen and it's fine.

CHAIRMAN POWERS: And it costs a fortune.

MEMBER ARMIJO: It's not as expensive as Inconel. It's damn close.

(Laughter)

MEMBER STETKAR: Four times a large number of linear feet of this stuff.

MEMBER ARMIJO: Yes, and it's good in brackish water, which is great.

MR. RAO: I can attest to that, because he bought one elbow, $900.

MEMBER ARMIJO: I can see why. It's --

(Crosstalk)

MR. WHEELER: You'll have to buy, like 2,000 feet of pipe times four.

(Crosstalk)

MEMBER STETKAR: This big.

CHAIRMAN POWERS: Okay. Mike, are you prepared to answer questions about the fire?

MR. TAKACS: Yes, we are. I believe the technical reviewer is here now.

MS. WEAVER: Could you introduce him, please?

MR. TAKACS: Bob Vettori from the plant systems group. Okay, we'll switch out.

MEMBER STETKAR: I only have two questions and I'm not sure how they relate to the details of the fire hazards analysis because I've not looked at those details except as they're summarized in that FSAR table.

But a couple things that I noticed. The first thing, that there is a Table 9 Baker dash 1 in the FSAR that lists heat release rates, 75th percentile, 98th percentile, heat release rates for a variety of water characterized as, I've forgotten the word that's used but kind of standard things. It's like, you know, a pump and that sort of thing.

And those values, at least in the documentation in the FSAR, are derived from NUREG/CR-6850 which provides a basis for both deterministic and probabilistic fire analyses.

And, indeed, the same values appear in a corresponding Table 9A-1 in the EPR FSAR, the certified design FSAR.

If I look at those, I noticed that there was a difference, in particular for transient, combustible heat release rates and in particular the difference is in the FSARs, both now. The 75th percentile heat release rate is listed as 70 kilowatts and the 98th percentile is 200 kilowatts.

If I go to NUREG/CR-6850 Table G-1, it lists 75th percentile heat release rate of 142 kilowatts, about twice, and 98th percentile 317 kilowatts. CR-6850 is very precise about these things.

Now, my question is that I personally haven't followed every bit of the transient heat release rate discussion that has evolved over a few years in the risk-informed fire protection NFPA 805 analysis area.

So I don't know, for example, today in November of 2013 whether or not those transient heat release rates that I just mentioned from that table in NUREG/CR-6850 are, indeed, the staff, I don't want to say approved, but accepted heat release rates that people are using for transient combustibles in their risk-informed NFPA 805 probabilistic analyses.

I don't know that because I haven't tried to follow all of the frequently asked questions, so I don't know. Do you know? Are they, or are the same heat release rates that are in the NUREG/CR-6850 still used for transients?

MR. VETTORI: I don't know.

MEMBER STETKAR: Transients have been one of the areas that the staff and the industry have been at loggerheads for a while. So I don't have that personal information so I couldn't say, well, I know that heat release rates are X and Y.

So my question to you is if the heat release rates that the staff currently accepts are no different from those in NUREG/CR-6850, at least that table where I could find them, why are the transient heat release rates that are at least cited in both the certified design FSAR table and the corresponding table for the COLA FSAR lower by nearly a factor of two?

MR. VETTORI: I have to look into it for you.

MEMBER STETKAR: I wanted you here because you're the fire guy and you understand what I'm saying about them.

MR. VETTORI: Yes, sir. I understand what you're saying.

MEMBER STETKAR: Okay. So that was one question. The other question, and it also relates to transient fires and this also applies for both the COL FSAR and the design FSAR, EPR FSAR.

There are three different categories of transient fire locations, if I can do that. In other words, if I walk into a location I will allocate it to one of three transient fire bins if I recall. They're called THL 1, 2 and 3.

And THL 1, the lowest of those bins, it's my understanding transient fires are not evaluated for those locations.

THL 2 is basically a sort of normal amount of transients which are associated with sort of average, maybe somebody goes in there once a shift, maybe you can do maintenance on things, things like that.

THL 3 is a lot of transients. You know, these are places that you either do a lot of work or high traffic areas, things like that.

The THL 1 in particular, there are a list of qualifications, normally closed to any type of traffic or not visited often, not more than once per week or not occupied during normal plant operations and where maintenance active these would generally be disallowed during that power modes plant operations.

Important to get on the record, such fire areas should also be subject to administrative controls that disallow leaving or storing unattended transient combustible materials.

This is another issue that has received extensive discussion between the staff and the industry in the risk-informed fire analyses.

And it's my understanding, here I did a little bit of homework, there's a frequently asked question, FAQ 12-0064, it's titled, "Hot work/transient fire frequency, influence factors," that specifically addresses this, among other issues.

And it's my understanding that the staff, at least in the risk-informed analyses, says that unless you cannot physically enter an area during power operation you must account for some amount of transient combustibles.

Now, the probability of it being there is variable, which is these influencing factors, but you can't simply say that just because I have administrative controls I have zero transient combustibles.

So this THL 1 category seems inconsistent with that notion. And my question is why can I do that in a deterministic analysis when I can't do it in a probabilistic analysis? It doesn't seem consistent.

As I said, I have no idea what the implications are for my deterministic fire analyses, but if the probabilistic guys have to account for it with some non-zero probabilities, it's not clear why the deterministic guys are allowed to assign zero probability, in effect not account for it. So I don't know if you have any insights on that.

MR. VETTORI: I'll look into it again.

MEMBER STETKAR: Okay. Those are the two issues I wanted to get out on the table.

MR. VETTORI: On the second one, can you write down your question to me?

MEMBER STETKAR: Well, the question is --

MR. VETTORI: So I get it right.

MEMBER STETKAR: Yes. In particular this THL 1 category and, as I said, this applies equally to the design certification as the COL so it's a broader question than perhaps just your review. I don't know if you did the review for the design cert or not.

MR. VETTORI: Not initially.

MEMBER STETKAR: Okay. And my problem, I didn't look at that, the design cert, in enough detail to trigger the right neurons at the time they asked this question and we looked at Chapter 9 in that venue.

But the question is it's my understanding that in the deterministic fire analyses or fire hazards analyses that are performed, no transient combustibles are considered for a location that is designated THL 1.

MR. VETTORI: Got you.

MEMBER STETKAR: And the question is why is that? Why does the staff accept that, given the position that the staff has taken on the probabilistic side of the fence?

MR. VETTORI: Side, okay.

MEMBER STETKAR: Okay?

MR. VETTORI: Understand.

MEMBER STETKAR: Okay, good. Thank you.

CHAIRMAN POWERS: Good.

MR. VETTORI: Got it.

CHAIRMAN POWERS: Okay. Bob, thank you.

MR. VETTORI: You're welcome.

CHAIRMAN POWERS: Appreciate that. Let's see, we've covered points for the next meeting. Did you have any questions or --

MR. TAKACS: Yes, Dr. Powers. I just want to kind of get a capture or summary of what your expectations are for responding to that, what we need to do as a staff to get back to you and do we need to do this at a certain time frame before the full committee?

CHAIRMAN POWERS: The answer to that one is no.

MR. TAKACS: Okay.

CHAIRMAN POWERS: Okay. The second question, our expectations from you are, I mean we posed a lot of questions and you consider them as you will as you move forward.

MR. TAKACS: Okay.

CHAIRMAN POWERS: Okay? To the extent that you can answer them, that's great. To the extent that you don't, you're likely to hear them in a more formal sense from the full committee.

I cannot tell you what the full committee will do but they do tend to listen to what the subcommittee has to say and so you'll tend to hear them again if you don't have an answer to them.

Because of this stage thing, we don't expect all questions to be answered until the final stage, okay? And telling us we'll get back to you is a fine answer.

MR. TAKACS: Okay. So we can continue to move forward as we would in Phase 4? This is not a hold up or a showstopper, any of the questions?

CHAIRMAN POWERS: That was my next question to the committee. My perception is that we are in a position to recommend to the full committee to move this COLA application from the current Phase 3 to Phase 4.

That is a movement with open items forward to the resolution of those open items, that we have identified nothing here that the staff and the applicant don't seem to have a success path ahead. Is there any contrary opinion on the committee?

MEMBER STETKAR: No, from my perspective.

MEMBER ARMIJO: No, not from my perspective.

CHAIRMAN POWERS: So my draft recommendation is essentially going to be that those chapters that I listed out here, to the full committee, is to recommend that we move from Stage 3 to Stage 4 on those things.

And in doing so, that will have moved the entire COLA from Stage 3 to Stage 4. Okay? So that's our intention, all parties concerned, from the subcommittee.

I cannot make any vouchsafe on what the full committee itself will do, okay? But I can tell you what our recommendation is going to be.

MR. TAKACS: Okay.

CHAIRMAN POWERS: Okay? Again, I would thank all the presenters for being very informative today and staying on schedule.

Now, I want you guys to all plug your ears because I have another issue to bring up with our chairman.

MEMBER STETKAR: On the record?

CHAIRMAN POWERS: I think so. I think so.

MEMBER STETKAR: I want a lawyer.

CHAIRMAN POWERS: The vice chairman has once again raised this issue of safety-related versus important to safety. It has come up in many, many contexts.

You guys are supposed to have your ears closed. You're not supposed to hear this.

MEMBER STETKAR: Read the transcript.

CHAIRMAN POWERS: This has nothing to do with this application. This is a different, persistent issue that I think the ACRS needs to come down and acquaint the Commission with the fact that they have some un-clarity in their regulatory guidance on how to handle these various things. And it comes from the Commission declaring their PRA policy statement with inadequate support for it. And they need to straighten this thing out.

MEMBER ARMIJO: We made a crack at that previously.

CHAIRMAN POWERS: We've made a crack at that but it looks like we need to hit it again.

MEMBER ARMIJO: Yes.

MEMBER STETKAR: I mean it can potentially have headaches in the real world once plants get operating --

CHAIRMAN POWERS: Absolutely.

MEMBER STETKAR: -- because the scope of things that are in or out of things that look like the maintenance rule can vary significantly.

Thus far it's only on paper and everybody says, well, after we get the COL, once we get operating we'll have our operating reliability assurance program, but most of those same criteria are applied. What is important to safety, to populate that list?

And for some plants that list right now is very, very long and if, indeed, that is the, in a regulatory space, this in-between level of attention, then the same consistent in-between level of attention ought to be given to not only how do you maintain a particular pump but also the ventilation systems and, you know, the evaluation of fires in those areas and so forth and so on.

CHAIRMAN POWERS: Yes, and at the same time, you know, the difficulty we're presenting both the inspector of course and the licensee is that we have all these things that in our risk analysis don't amount to anything being treated with an equal fashion with a bunch of stuff that does amount to something.

And, you know, we need to get some clarification, at least so that I understand it better and whatnot. We need to put this on our agenda. Again, has nothing to do with this application, but it has to do with the regulatory structure and how we communicate with the rest of the world. We pass that information on to you --

MEMBER ARMIJO: And we will do something.

CHAIRMAN POWERS: Well, I think, you know, to some extent it's the --

MEMBER ARMIJO: We've seen it before and it's going to come back again and again and --

CHAIRMAN POWERS: Yes, regulatory policies and procedures needs to look at it and the PRA subcommittee needs to look at it and we need some help.

I mean everybody needs some help on this thing and we need to say what it is that we think is really important and we can't say that everything is important because it's silly.

MEMBER ARMIJO: Right. No, it's useless.

CHAIRMAN POWERS: All right. Just doesn't help anybody. That said, I'm prepared to adjourn this subcommittee meeting.

(Crosstalk)

CHAIRMAN POWERS: We're adjourned with thanks to everybody involved.

(Whereupon, the meeting in the above-entitled matter was concluded at 3:57 p.m.)

UNISTAR NUCLEAR ENERGY

Presentation to ACRS
U.S. EPR™ Subcommittee
Calvert Cliffs Nuclear Power Plant Unit 3
FSAR Chapter 2.4, Hydrologic Engineering
November 06, 2013

Introduction

- RCOLA authored using ‘Incorporate by Reference’ (IBR) methodology.
- To simplify document presentation and review, only supplemental information, site-specific information, or Departures/exemptions from the U.S. EPR FSAR are contained in the COLA.
- AREVA U.S. EPR FSAR ACRS Meeting for Chapter 2 – Site Characteristics occurred on November 3, 2009.

Introduction

- No Departures and No Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 2.4.
- No ASLB Contentions
- Fifteen (15) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 2.4.

Introduction

- Today Mark Finley, UniStar - President, CEO and CNO will present the Calvert Cliffs Unit 3 FSAR Chapter 2.4.
- Today's presentation was prepared by UniStar and is supported by Bechtel, Rizzo Associates and AREVA.
  - Ahmed "Jemie" Dababneh, PhD., Rizzo Associates –Technical Director
  - Shankar Rao, Bechtel – Project Engineer
  - Mustafa Samad, PhD., Bechtel – Sr. Engineering Specialist-Hydrology
- The focus of today's presentation will be on site-specific information that supplements the U.S. EPR FSAR.

Chapter 2.4 Hydrologic Engineering Agenda

- **2.4 - HYDROLOGIC ENGINEERING**
- **CONCLUSIONS**

2.4 HYDROLOGIC ENGINEERING

2.4 Hydrologic Engineering
COL Information Item 2.4-1

- COL applicant will provide a site-specific description of the hydrologic characteristics of the plant site.

➢ Hydrological Characteristics

  - The Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 site is located on the Calvert peninsula within the Chesapeake Bay watershed, adjacent to and southeast of CCNPP Units 1 and 2.
  - The Chesapeake Bay constitutes the main water body influencing the siting of CCNPP Unit 3.
  - The Calvert peninsula is formed by the Chesapeake Bay to the east and the Patuxent River to the west.
  - Drainage in the vicinity of the CCNPP site includes several small streams and creeks, which fall within two sub-watersheds of the Chesapeake Bay with the drainage divide running nearly parallel to the shoreline.
  - All streams and creeks near the CCNPP Unit 3 site east of Maryland State Highway (MD) 2/4 are non-tidal.

2.4 Hydrologic Engineering
COL Information Item 2.4-1

- COL applicant will provide a site-specific description of the hydrologic characteristics of the plant site. (continued)

➢ Plant Siting

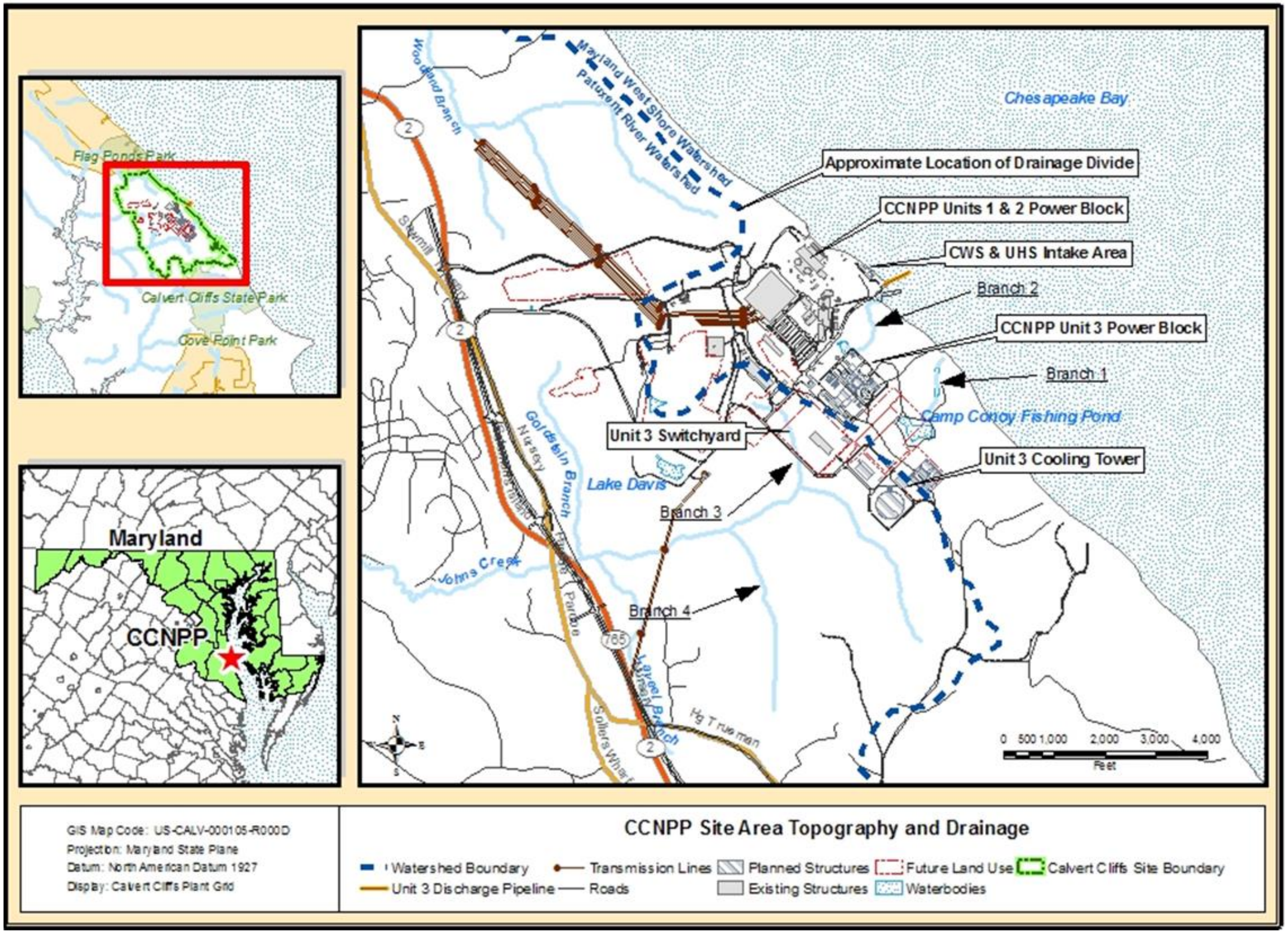
  - The CCNPP Unit 3 safety-related structures, systems and components (SSCs) will be located within the Maryland Western Shore Watershed at the Power Block area and at the Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS) area.
  - Access to safety-related structures, systems and components (SSCs) in the power block area will be located at or above Elevation 84.6 ft.
  - The deck of the UHS MWIS will be at approximately Elevation 11.5 ft with openings or entrances to the MWIS located at or above Elevation 36.5 ft.

2.4 Hydrologic Engineering
COL Information Item 2.4-1

Aerial View of CCNPP Unit 3 Site on the Calvert Peninsula

2.4 Hydrologic Engineering
COL Information Item 2.4-1

CCNPP Unit 3 Site Area



2.4 Hydrologic Engineering
COL Information Item 2.4-1

- COL applicant will provide a site-specific description of the hydrologic characteristics of the plant site. (continued)

➢ Dams and Reservoirs
  - There are no dams or reservoirs on St. Leonard Creek or its tributaries.
  - There are two dams on the Patuxent River.
    - These are Rocky Gorge Dam and Brighton Dam, located approximately 75 and 85 miles from the mouth of the Patuxent River, respectively.
    - Potential failure of these dams would have no influence on conditions at the Calvert Cliffs Unit 3 site.

➢ Surface Water Usage
  - Use of surface water near the Calvert Cliffs Unit 3 site is mainly non-consumptive involving the Chesapeake Bay and the Patuxent River.
  - The nearest surface water withdrawal locations include the Morgan State University Estuarine Research Center (ERC), located approximately 4 mi northwest of the site, and Dominion Cove Point Liquid Natural Gas (LNG) facility, located approximately 4 mi to the south-southeast of the site.

2.4 Hydrologic Engineering
COL Information Item 2.4-1

- COL applicant will provide a site-specific description of the hydrologic characteristics of the plant site. (continued)

➢ Ground Water Characteristic
  - The proposed water source to meet the water demand requirements during the operation of Calvert Cliffs Unit 3 is a desalinization plant utilizing water from the Chesapeake Bay.
  - An additional source of water will be required during construction activities until the desalinization plant is operational.
  - Construction water needs are expected to be satisfied by appropriating water from CCNPP Units 1 and 2 using the established ground water permits.

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

- A COL applicant will identify site-specific information related to flood history, flood design considerations, and effects of local intense precipitation.
- A COL applicant will use site-specific information to compare the location and elevations of safety-related facilities, and of structures and components required for protection of safety-related facilities, with the estimated static and dynamic effects of the design basis flood conditions.

➢ Flood History
  - The CCNPP site is subject to flooding from the Chesapeake Bay, Johns Creek and two small unnamed streams identified on Figure 2.4-1 as Branch 1 and Branch 2.
  - The five highest recorded water levels at Baltimore and Annapolis are presented in Table 2.4-26. Each of these high water levels is associated with surges from tropical storm events.
  - Since the construction and operation of CCNPP Units 1 and 2 there have been no instances of flooding of the CCNPP Units 1 and 2 grade area surrounding the pump intake area at Elevation 10.0 ft.
  - There are no records of any landslide (submarine or subaerine) or distant tsunami source induced flooding events at the CCNPP site.

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

Table 2.4-26— {Five Highest Historical Water Levels at Baltimore and Annapolis} it10022

Baltimore			Annapolis		
Hurricanes	**Date**	**Above MHHW ft (m)**	**Hurricanes**	**Date**	**Above MHHW ft (m)**
Unnamed	August 1933	6.75 (2.056)	Isabel	September 2003	5.76 (1.756)
Isabel	September 2003	6.48 (1.976)	Unnamed	August 1933	5.55 (1.691)
Connie	August 1955	5.22 (1.591)	Connie	August 1955	4.09 (1.248)
Unnamed	August 1915	4.53 (1.381)	Hazel	October 1954	3.90 (1.190)
Hazel	October 1954	4.33 (1.319)	Fran	September 1996	3.48 (1.060)

MHHW-Mean Higher High Water

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

- A COL applicant will identify site-specific information related to flood history, flood design considerations, and effects of local intense precipitation. (continued)
- A COL applicant will use site-specific information to compare the location and elevations of safety-related facilities, …….. (continued)

➢ Flood Design Considerations

  - The design basis flood elevation for the CCNPP site is determined by considering a number of different flooding possibilities. The flooding possibilities applicable and investigated for the site include:
    - ✓ The probable maximum flood (PMF) on streams and rivers, potential dam failures, probable maximum surge and seiche flooding, probable maximum tsunami, and ice effect flooding.
  - Each of these flooding scenarios was investigated in conjunction with other flooding and meteorological events, such as wind generated waves, as required in accordance with guidelines presented in ANSI/ANS 2.8-1992.
  - The maximum PMF water level for Johns Creek is Elevation 65.0 ft. Safety-related facilities for CCNPP Unit 3 are located at Elevation 85.0 ft.

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

- A COL applicant will identify site-specific information related to flood history, flood design considerations, and effects of local intense precipitation. (continued)
- A COL applicant will use site-specific information to compare the location and elevations of safety-related facilities, …….. (continued)
  - The probable maximum storm surge (PMSS) water level on the Chesapeake Bay is estimated to be at Elevation 17.6 ft.
    - ✓ Wave action from coincident winds associated with the storm surge produce a wave run-up height of 15.6 ft above the PMSS resulting in a maximum flood level of Elevation 33.2 ft on the UHS MWIS.
    - ✓ The PMSS and coincident wave run-up water level at the CCNPP Unit 3 site produce the highest potential water levels on the Chesapeake Bay and become the design basis flood elevation for the CCNPP Unit 3 Ultimate Heat Sink (UHS) makeup intake structure area.
    - ✓ The UHS makeup intake structure will be provided with flood protection measures such as water tight doors, roof vents, and piping and conduit penetrations.
    - ✓ The CCNPP Unit 3 power block site grade is at nominal Elevation 85.0 ft. Safety-related facilities other than the UHS makeup intake structure are located above the PMSS and wave run-up water level.

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

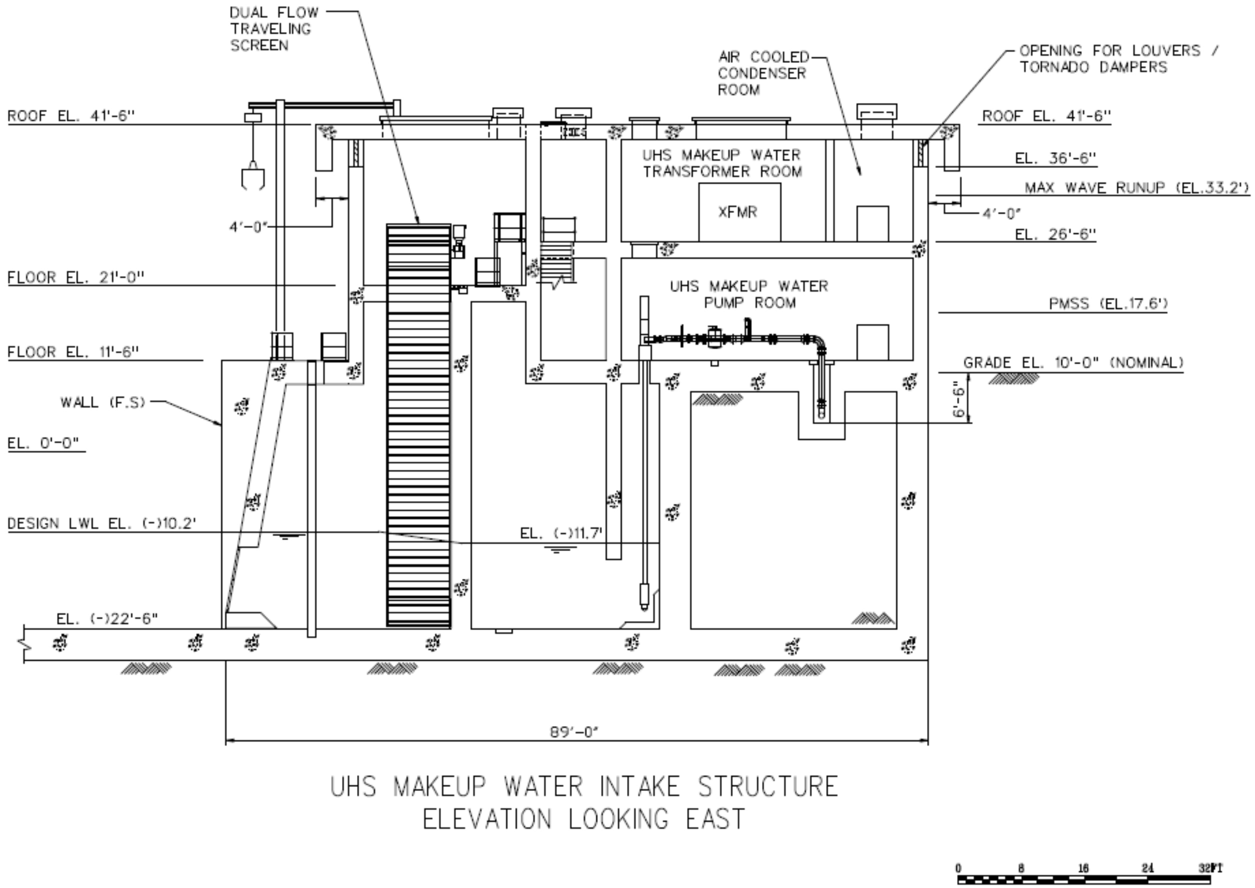
Tidal and Surge Levels

Antecedent Water Level Components		
Component	**Estimate (ft)**	**Datum**
10% exceedance high tide	1.53	MSL
Initial Rise	1.1	MSL
Sea Level Rise	1.07	MSL
Adjustment factor to NGVD29	0.64	
Total Antecedent Water Level	**4.34**	NGVD29

Total Storm Surge Level (ft)		
Component	**Estimate (ft)**	**Datum**
FSAR Antecedent Water Level	4.4	NGVD29
Maximum Surge Level	13.2	NGVD29
Maximum Wave Runup	15.6	NGVD29
Total Water Level	**33.2**	NGVD29

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

UHS MWIS Cross Section



2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

- A COL applicant will identify site-specific information related to flood history, flood design considerations, and effects of local intense precipitation. (continued)
- A COL applicant will use site-specific information to compare the location and elevations of safety-related facilities, …….. (continued)

➢ Effects of Local Intense Precipitation on Calvert Cliffs Unit 3 Power Block Area
  - The U.S. Army Corps of Engineers (USACE) computer program Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) was used to determine peak discharges in the site drainage ditches.
  - The USACE computer program HEC – River Analysis System (HEC-RAS) was used to determine the maximum PMP water level at a safety-related structure.
  - The maximum PMP water level in the Power Block area is Elevation 81.5 ft . This water level, which becomes the design basis flood elevation for the safety-related facilities in the Power Block area, is 3.1 ft. below the lowest reactor complex entrance at Elevation 84.6 ft.
  - Table 2.4-16 gives the entrance elevations at the various safety-related facilities and compares them with the PMP water levels near those facilities.
  - The design basis for the local intense precipitation is the ‘all season 1 square mile’ or point PMP (probable maximum precipitation) as obtained from the U.S. National Weather Service (NWS) Hydro-meteorological Report Number 52. Table 2.4-22 presents the 1 square mile PMP for various durations at the CCNPP site.

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

Table 2.4-22— {Point (1 mi^2) Probable Maximum Precipitation Depths}

Time (min)	PMP Depth in (cm)
60	18.48 (46.94)
30	13.86 (35.20)
15	9.70 (24.64)
5	6.15 (15.62)

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

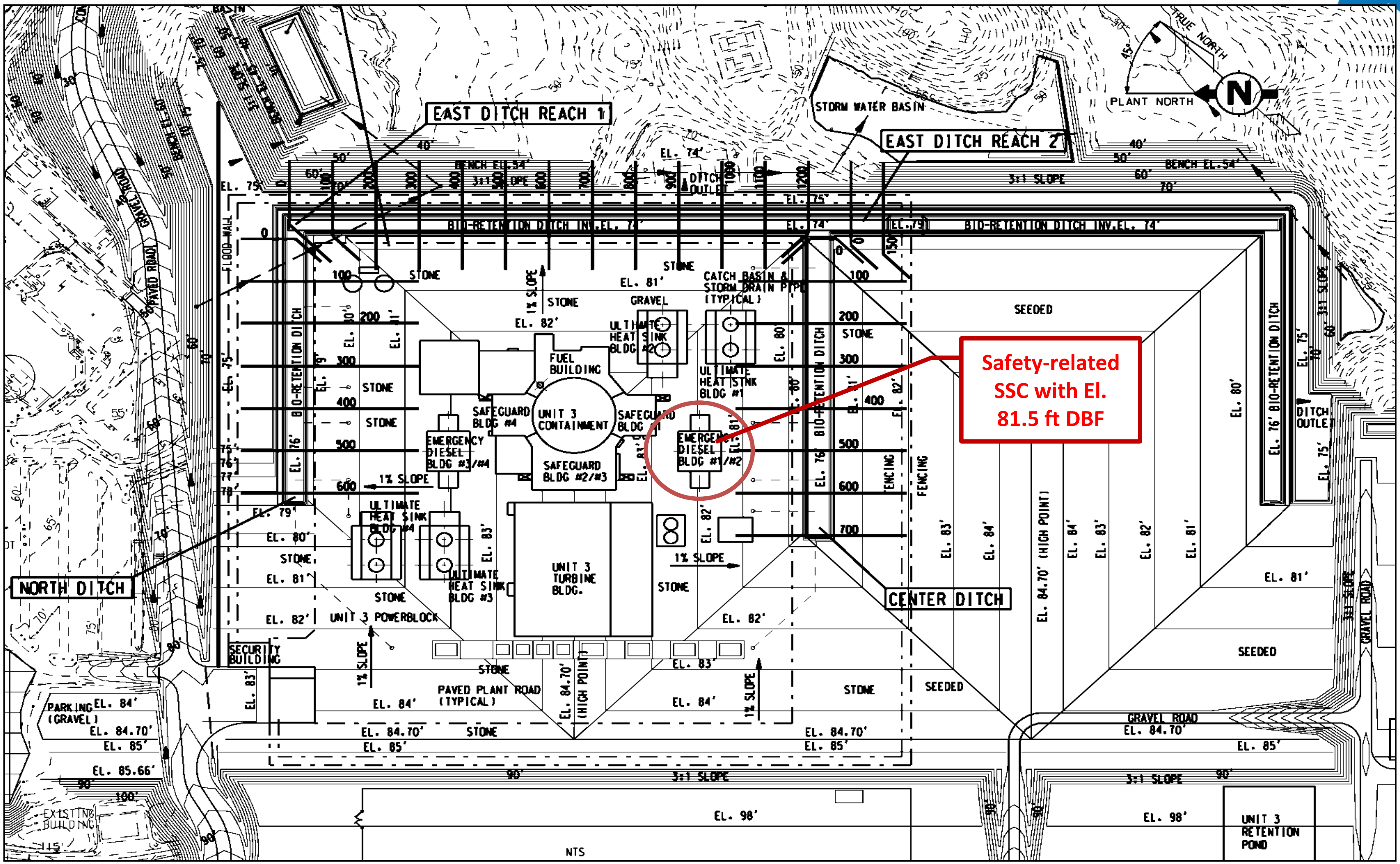
Table 2.4-16— {Safety-Related Facility Entrance Elevation Summary}

Safety-Related Facility	Entrance Elevation (ft)	Associated Cross Section	Ditch	PMP Peak Water Elevation (ft)	Freeboard (ft)
Northwestern UHSs	98.6 ft	600	North	79.8	18.8
Southeastern UHSs	98.6 ft	300	Center	81.3	17.3
North Diesel Generator	85.1 ft	500	North	79.8	5.3
South Diesel Generator	85.1 ft	500	Center	81.5	3.6
Reactor Complex*	84.6 ft	400	North	79.7	4.9
		400	Center	81.4	3.2

* Includes containment, fuel and safeguards buildings

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

Figure 2.4-16— CCNPP Unit 3 Drainage Ditch Cross Sections



2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

- A COL applicant will identify site-specific information related to flood history, flood design considerations, and effects of local intense precipitation. (continued)
- A COL applicant will use site-specific information to compare the location and elevations of safety-related facilities, …….. (continued)

➢ Effects of Local Intense Precipitation on Calvert Cliffs Unit 3 UHS Makeup Water System

- The design basis flood elevation near the UHS Makeup Water Intake Structure (MWIS) is due to the probable maximum storm surge and coincidental wind wave actions.
- The buried UHS pipeline follows an alignment part of which could be affected by the local PMP discharge from Calvert Cliffs Units 1 & 2 and Unit 3 areas.
- The USACE computer programs HEC-HMS and HEC-RAS were used to develop the hydrologic and hydraulic models and determine peak discharges, maximum water levels and velocities over the UHS pipeline.
- In order to protect the UHS pipeline from potential scouring during a PMP event, the stormwater drainage swales, as well as the Haul Road, will be lined with concrete to resist the erosive forces. This applies to the section of makeup water pipe crossing between the Unit 3 flood wall and the end of the stormwater swales (Figure 2.4-8).
- Riprap placements on the Chesapeake Bay shoreline and on the slope behind the MWIS would prevent any erosion impact to the MWIS, intake pipeline and UHS pipeline.

2.4 Hydrologic Engineering
COL Information Items 2.4-2 & 2.4-11

Figure 2.4-8— {Calvert Cliffs Unit 3 Utility Corridor (with UHS Makeup Water Buried Piping)}

2.4 Hydrologic Engineering
COL Information Item 2.4-3

- A COL applicant will provide site-specific information to describe the probable maximum flood of streams and rivers and the effect of flooding on the design.

➢ Probable Maximum Flood (PMF) on Streams and Rivers

- Sources of potential PMF at the site are the Chesapeake Bay to the east, and the Johns Creek-St. Leonard Creek-Patuxent River System to the west.
- River discharges into the Chesapeake Bay can have some effect on water levels in the Chesapeake Bay. However, the effect is minimal in comparison with flood water levels generated by e.g., tide levels, and storm surges. Thus, the water levels in the Chesapeake Bay due to the PMF on streams and rivers that are tributaries to the Chesapeake Bay are not assessed.
- Johns Creek, St. Leonard Creek, Patuxent River system is tidally influenced at the mouth of Johns Creek and is an extension of the Chesapeake Bay.
- The CCNPP site is located far enough away from the limit of the tidally influenced areas that flood flows on these water courses have no influence on the water levels near the site. Thus, neither St. Leonard Creek nor the Patuxent River is analyzed for the PMF on streams or rivers for the CCNPP site.

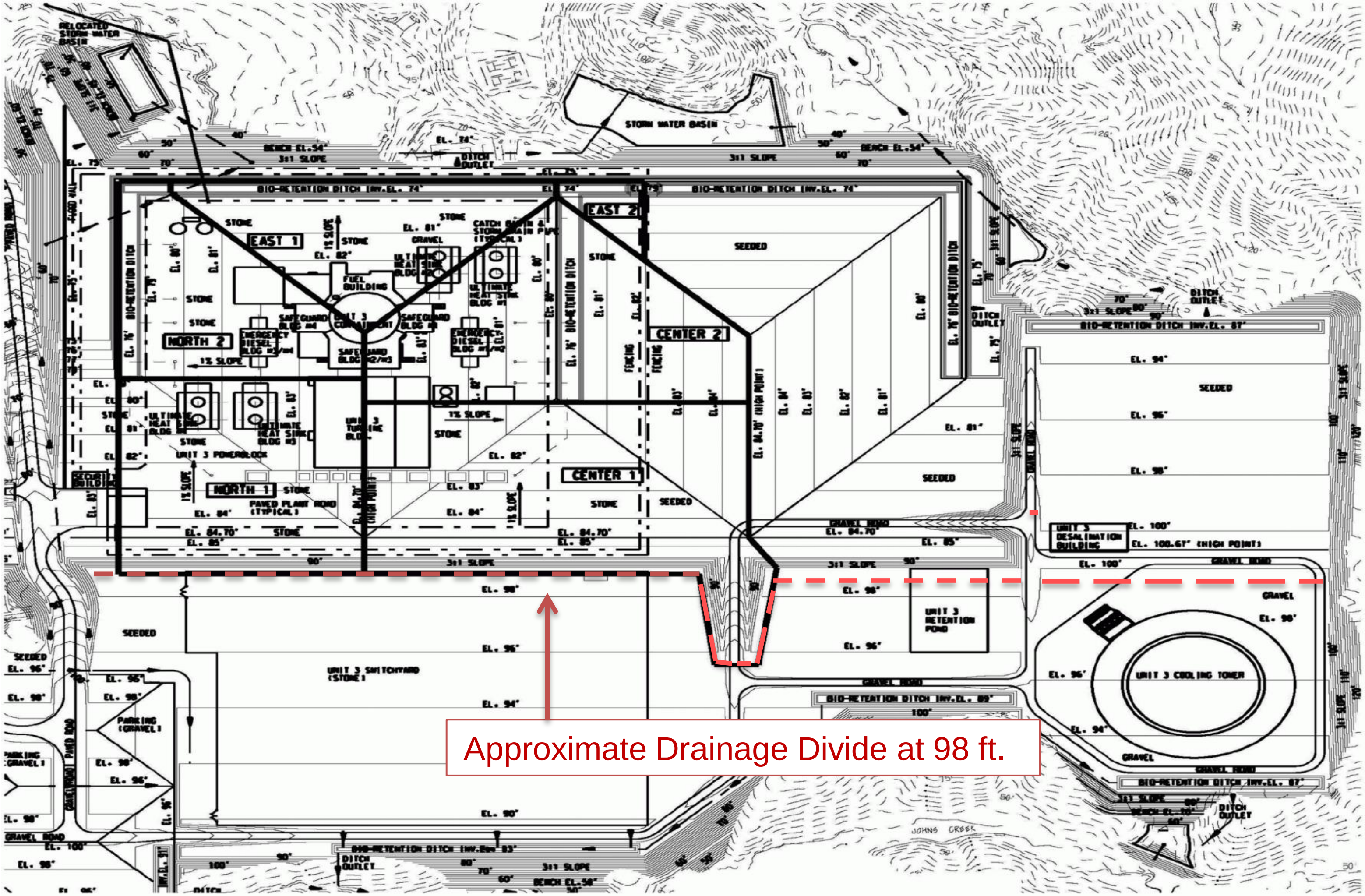
2.4 Hydrologic Engineering
COL Information Item 2.4-3

- A COL applicant will provide site-specific information to describe the probable maximum flood of streams and rivers and the effect of flooding on the design. (continued)
  - A portion of Johns Creek, upstream of the tidally influenced reach, is located immediately west of the proposed switchyard area. Thus, a PMF analysis is performed on Johns Creek to determine the PMF water levels near the site, conservatively assuming that the culvert on MD 2/4 is completely clogged.
    - ✓ The results of the analysis indicate a maximum PMF water surface elevation of 65 ft on Johns Creek at the CCNPP site.
    - ✓ The water level in Johns Creek would have to exceed the drainage divide boundary at Elevation 98.0 ft, which passes through the CCNPP Unit 3 switchyard. The drainage divide boundary is about 33.0 ft above the maximum PMF elevation on Johns Creek.

2.4 Hydrologic Engineering

COL Information Item 2.4-3

Figure 2.4-7— CCNPP UNIT 3 Sub-Basin Drainage Boundaries



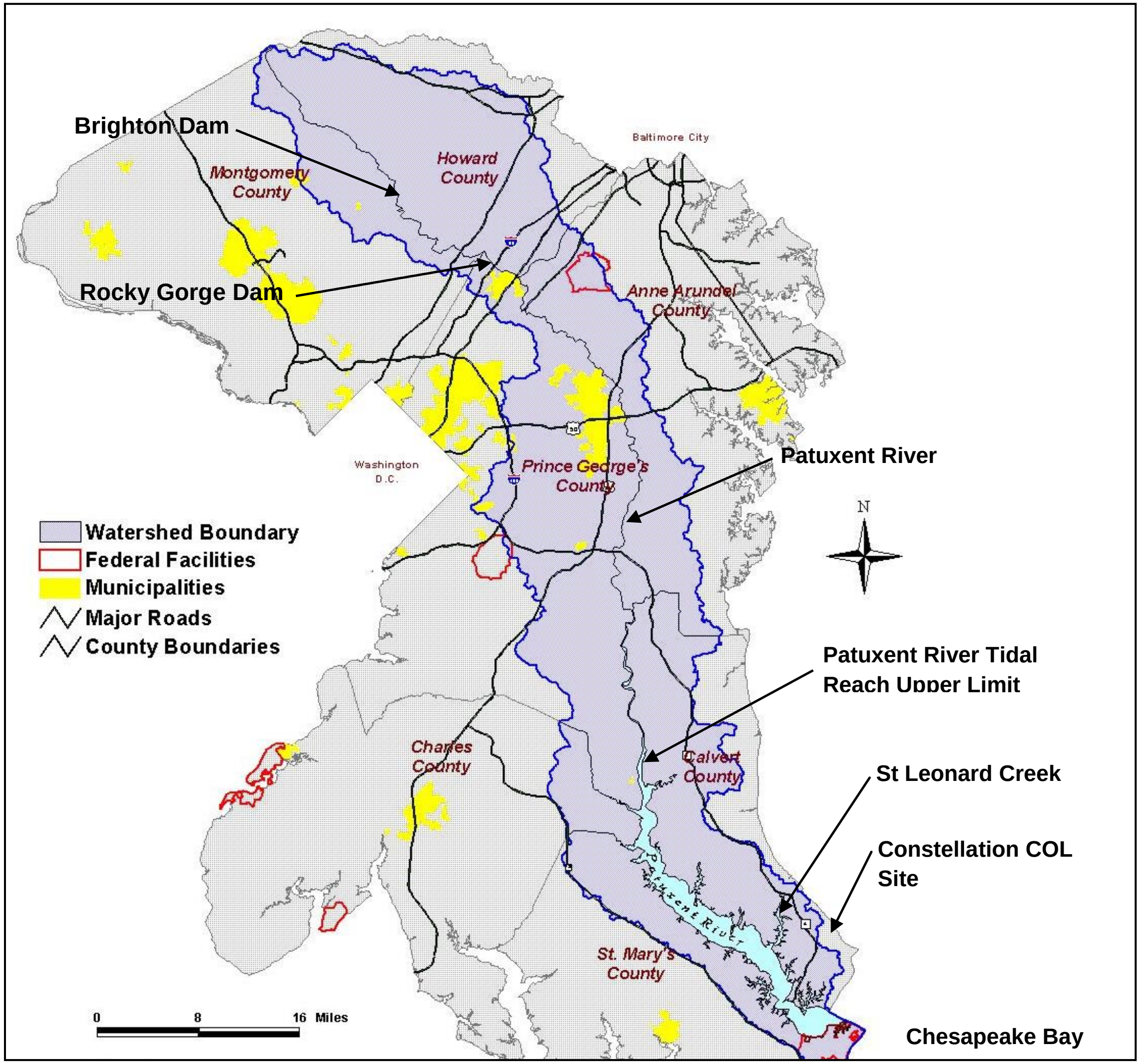
2.4 Hydrologic Engineering
COL Information Item 2.4-4

- A COL applicant will verify that the site-specific potential hazards to safety-related facilities due to the failure of upstream and downstream water control structures are within the hydrogeologic design basis.

➢ Potential Dam Failures
  - There are no dams on Johns Creek or St. Leonard Creek.
  - There are two dams on the Patuxent River.
    - ✓ If the total volume of these two reservoirs were to be instantly added to the tidal region of the Patuxent River and not allowed to escape into the Chesapeake Bay, the water level increase in the tidal river reach would be approximately 2 ft.
    - ✓ Flood levels in the upper reaches of Johns Creek and near the CCNPP site would not be affected.
  - Several other dams are located on other tributaries to the Chesapeake Bay upstream of the CCNPP site.
    - ✓ Dam failures from these other dams would have negligible flooding effect to the CCNPP site, as the flood waves would discharge directly into the Chesapeake Bay far upstream of the CCNPP site.

2.4 Hydrologic Engineering
COL Information Item 2.4-4

Figure 2.4-27 – {Patuxent River Watershed And Dam Locations}



2.4 Hydrologic Engineering
COL Information Item 2.4-5

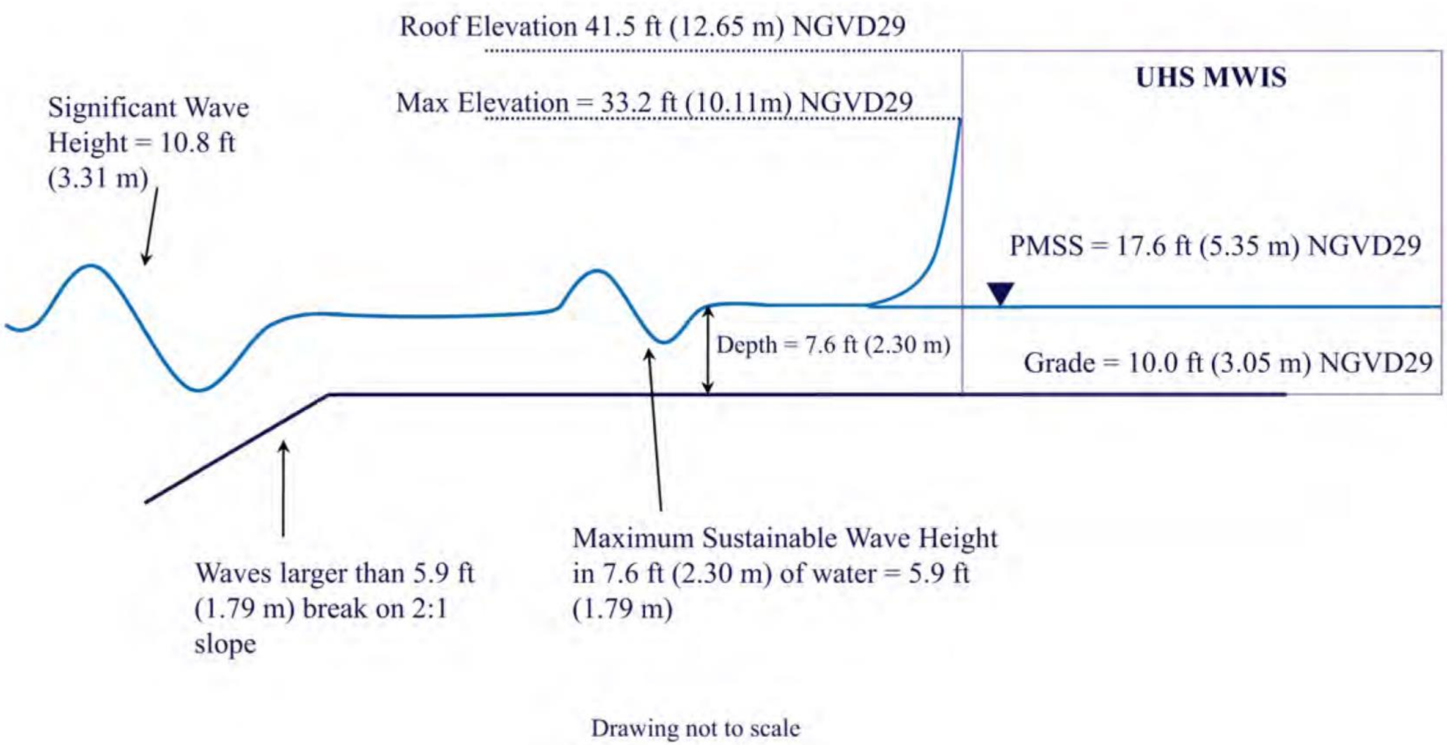
- COL applicant will provide site-specific information on the probable maximum surge and seiche flooding and determine the extent to which safety-related plant systems require protection. The applicant will also verify that the site-specific characteristic envelope is within the design maximum flood level, including consideration of wind effects.

➢ Probable Maximum Storm Surge (PMSS) and Seiche Flooding

  - The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model predicted a maximum surge elevation at the site of 11.0 ft from a water level of 0.0 NGVD 29. The simulated surge height was then adjusted to take into account the 20% margin (SLOSH model uncertainties) suggested in Technical Report NWS 48 (Jelesnianski, 1992) and the antecedent water level of 4.4 ft NGVD 29. The final PMSS elevation thus obtained is 17.6 ft NGVD 29.
  - The maximum wave runup on the intake structure was computed to be 15.6 ft. This runup, combined with the PMSS, will reach an elevation of 33.2 ft NGVD 29 as shown on Figure 2.4-33.
  - Because the effects of seiche oscillation are eliminated by a change in sustained wind direction, any existing seiche oscillation in the Chesapeake Bay prior to the arrival of any hurricane will be eliminated by the strong and changing wind field of the hurricane. Hence, resonance of seiche oscillation with PMSS is precluded.

2.4 Hydrologic Engineering
COL Information Item 2.4-5

Figure 2.4-33— {Schematic Diagram Wave Runup on the UHS Makeup Water Intake Structure (MWIS)}



2.4 Hydrologic Engineering
COL Information Item 2.4-6

- A COL applicant will provide site-specific information and determine the extent to which the plant safety-related facilities require protection from tsunami effects, including Probable Maximum Tsunami Flooding.

➢ Probable Maximum Tsunami (PMT) Flooding

  - The PMT amplitude and drawdown at the CCNPP site were computed for the three potential tsunami sources using the maximum and minimum tsunami-induced water surface elevations.
  - The maximum simulated amplitude and drawdown at the CCNPP site were obtained from the postulated submarine landslide at the Virginia-North Carolina continental shelf off the coast of Norfolk, Virgina.
  - The PMT amplitude was estimated to be 1.71 ft above the antecedent water level. Combining with the antecedent water level of 4.34 ft and tsunami runup of 5.13 ft, the PMT high water level is estimated as 11.18 ft or rounded up to 11.5 ft.
  - The PMT drawdown was estimated to be 1.24 ft below the antecedent water level. Combining with the mean lower-low water antecedent water level, the PMT low water level is estimated as -1.23 ft or rounded down to -1.5 ft.
  - Because the maximum and the minimum water levels at the CCNPP site would be affected by storm surges, the maximum and minimum water levels from the PMT did not represent limiting flood or low water design bases for the CCNPP site.

2.4 Hydrologic Engineering
COL Information Item 2.4-6

- A COL applicant will provide site-specific information and determine the extent to which the plant safety-related facilities require protection from tsunami effects, including Probable Maximum Tsunami Flooding. (continued)

➢ Effects on Safety-Related Facilities

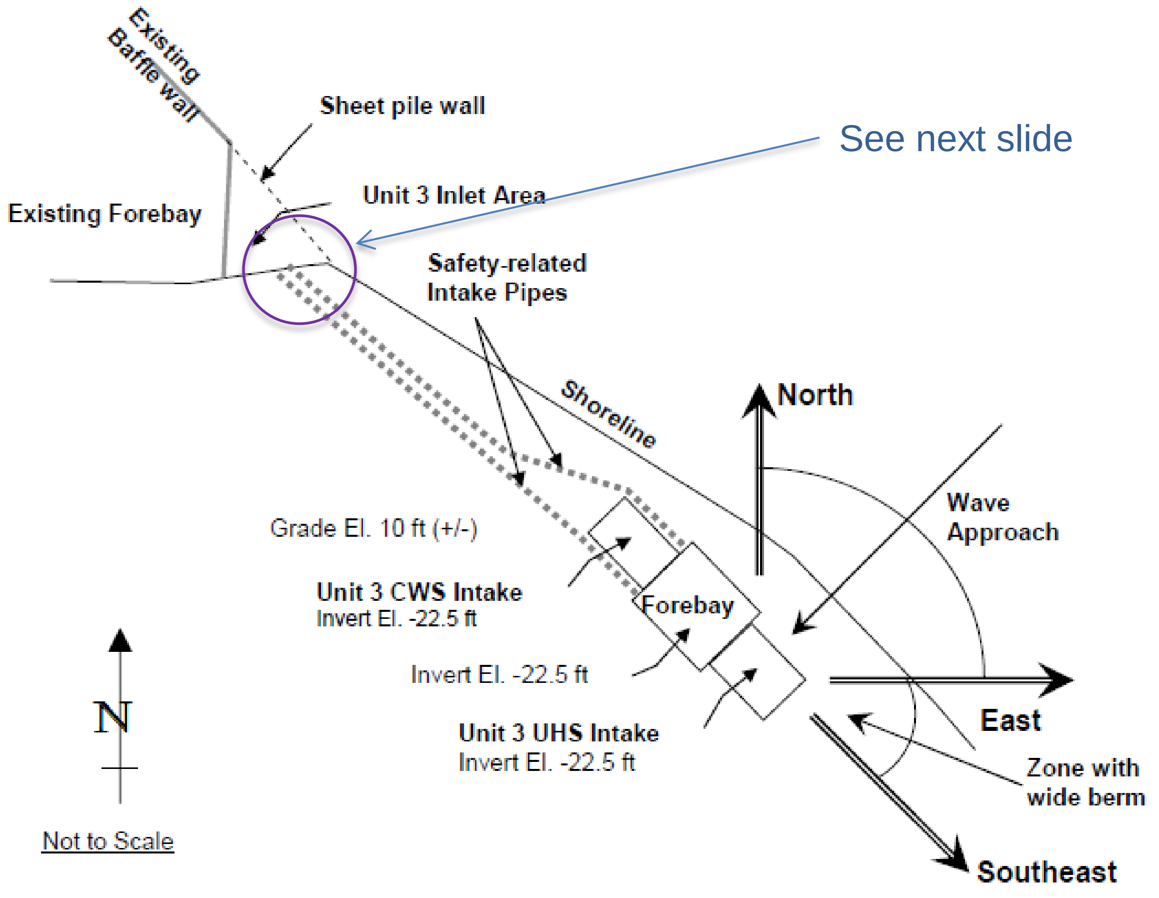
  - The CCNPP Unit 3 Power Block elevation is set at approximately 85.0 ft NGVD 29. The safety-related facilities on the power block will not be affected by the PMT.
  - The maximum water level at the safety-related UHS Makeup Water Intake Structure would be governed by the probable maximum storm surge height, not the PMT.
  - The hydrodynamic wave force on the UHS makeup water intake structure is controlled by the PMSS event.
  - The CCNPP Units 1 and 2 forebay baffle wall, CCNPP Unit 3 intake sheet pipe wall and inlet protection screen, protect the inlets of intake pipes that convey water to the UHS intake structure from debris and water-borne projectiles.
  - The Units 1 and 2 baffle wall and Unit 3 sheet pile wall protect the CCNPP Unit 3 intake pipe inlet area. Erosion effects near the intake pipe inlet would be negligible.

2.4 Hydrologic Engineering
COL Information Item 2.4-6

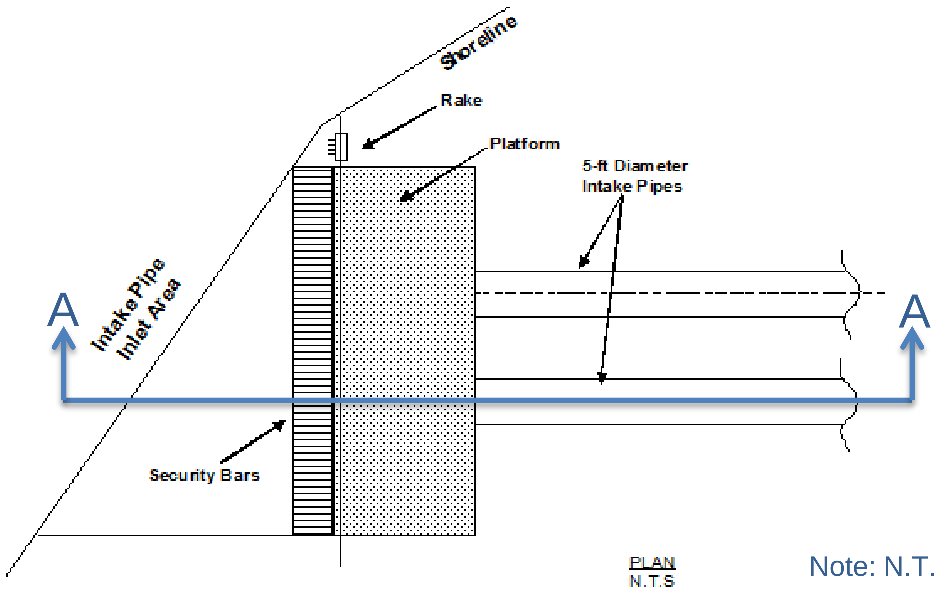
- A COL applicant will provide site-specific information and determine the extent to which the plant safety-related facilities require protection from tsunami effects, including Probable Maximum Tsunami Flooding. (continued)
- Effects on Safety-Related Facilities (Continued)
  - Suspended sediments flowing toward the CCNPP Unit 3 intakes would travel through the opening underneath the Units 1 and 2 forebay baffle wall and would likely deposit in the CCNPP Unit 3 inlet area sheltered by the baffle wall and the sheet pile wall. Because the inlets of the intake pipes are located at about 10 ft. above the bed elevation, blockage of intake pipes due to sediment deposition is unlikely as a result of the PMT.

2.4 Hydrologic Engineering
COL Information Item 2.4-6

Figure 2.4-25 – {Schematic Description of UHS Makeup Water Intake Location and Exposure for Wind Wave Estimation}

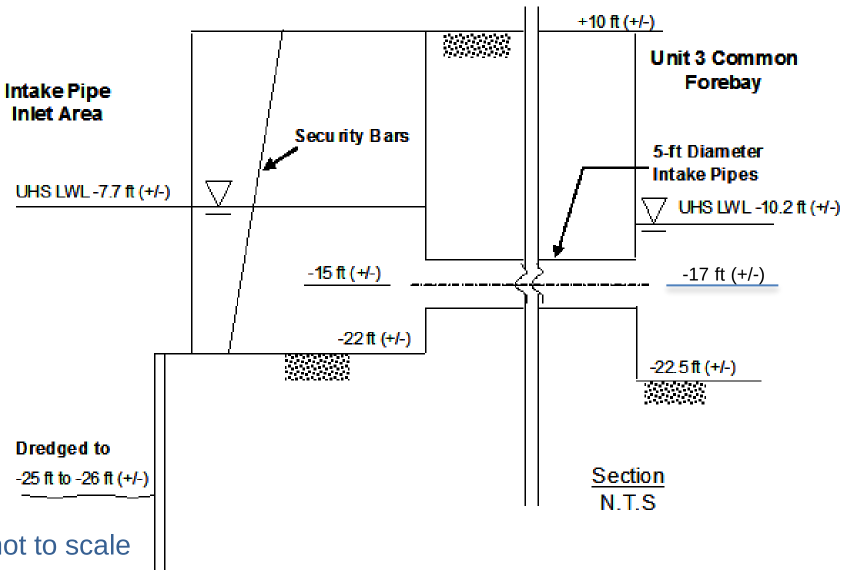


2.4 Hydrologic Engineering
COL Information Item 2.4-6



Inlet Area Plan View

Note: N.T.S = not to scale



Section A-A

2.4 Hydrologic Engineering
COL Information Items 2.4-7 & 2.4-8

- A COL applicant will provide site-specific information regarding ice effects and design criteria for protecting safety-related facilities from ice-produced effects and forces with respect to adjacent water bodies.
- A COL applicant will evaluate the potential for freezing temperatures that may affect the performance of the ultimate heat sink makeup, including the potential for frazil and anchor ice, maximum ice thickness, and maximum cumulative degree-days below freezing.

➢ Ice Effects

- The maximum ice thickness, 13 inches, that could form at the CCNPP site was estimated using historical air temperature data from the nearby Patuxent River Naval Air Station meteorological tower for the period of 1945 through 2006.
- Because the UHS intake pipe inlets are at Elevation -15 ft, the design low water in the Unit 3 inlet area is Elevation of -7.7 ft, there is no possibility that the Unit 3 inlet and the downstream UHS makeup water intake structure would be impacted by drifting ice or unrestricted ice sheets.
- Ice sheets formed within the common forebay for the CWS and UHS makeup intakes would be restricted by the skimmer walls at the entrance of the intake structures

2.4 Hydrologic Engineering
COL Information Items 2.4-7 & 2.4-8

- A COL applicant will provide site-specific information regarding ice effects and design criteria for protecting safety-related facilities from ice-produced effects and forces with respect to adjacent water bodies. (continued)
- A COL applicant will evaluate the potential for freezing temperatures that may affect the performance of the ultimate heat sink makeup, including the potential for frazil and anchor ice, maximum ice thickness, and maximum cumulative degree-days below freezing. (continued)

➢ Ice Effects (Continued)

  - Neither frazil ice nor anchor ice have been observed in the intake structure of the existing CCNPP Units 1 and 2 since the start of operation.
  - Additionally, continuous raking of the bar screens, frequent rotation of the traveling water screens and heat tracing of the equipment is be used to mitigate ice buildup at the intake.
  - The flood protection design of the CCNPP Unit 3 safety-related facilities assumed that catch basins, storm drains, and culverts are blocked rendering them inoperative during a local probable maximum precipitation (PMP) event.
  - Therefore, temporary blockage of site drainage areas will not affect the operation of safety-related facilities.

2.4 Hydrologic Engineering
COL Information Item 2.4-9

- A COL applicant will provide site-specific information and describe the design basis for cooling water canals and reservoirs used for makeup to the UHS cooling tower basins.

➢ Cooling Water Canals and Reservoirs

  - Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 does not include any canals or reservoirs used to transport or impound plant safety-related cooling water or for heat dissipation.
  - The safety-related Ultimate Heat Sink (UHS) Makeup Water Intake System utilizes the Chesapeake Bay as the water source.
  - The design of the safety-related SSCs will comply with the requirements of Regulatory Guide 1.27.

2.4 Hydrologic Engineering
COL Information Item 2.4-10

- A COL applicant will provide site-specific information and demonstrate that in the event of diversion or rerouting of the source of cooling water, alternate water supplies will be available to safety-related equipment.

➢ Channel Diversions

  - Given the seismic, topographical, geologic, and thermal evidence in the region, there is very limited potential for upstream diversion or rerouting of the Chesapeake Bay (due to channel migration, river cutoffs, ice jams, or subsidence) and adversely impacting safety-related facilities or water supplies.
  - The stabilized shoreline near the intake structures prevents any shoreline retreat.
  - Due to the submerged entrance of water under the existing baffle wall, surface ice in the Chesapeake Bay has no effect on the cooling water supply at the Unit 3 intake pipe inlets.
  - A postulated collapse of the shoreline cliffs to the north or south of the CCNPP site, during a seismic or severe weather event, is not expected to result in silt depositing in the Units 1 and 2 forebay; to such an extent that it would cause a loss of cooling water supply to the Unit 3 intakes.

2.4 Hydrologic Engineering
COL Information Item 2.4-12

- A COL applicant will identify natural events that may reduce or limit the available cooling water supply, and will verify that an adequate water supply exists for operation or shutdown of the plant in normal operation, anticipated operational occurrences, and in low water conditions.

➢ Low Water Considerations

- CCNPP Unit 3 relies on the Chesapeake Bay to supply water for safety-related and nonsafety-related purposes.
- As a conservative approach, the 100-year low water level at the CCNPP Unit 3 site is selected based on the Annapolis station, which is lower than Solomons Island. Therefore, the 100-year low water is -3.90 ft.
- Since the minimum design water level in the Forebay is set at -8 ft for the safety-related UHS makeup intake, the UHS makeup pumps supply sufficient water during the lowest water level due to negative surge from the PMH or tsunami (estimated at -7.7 ft).
- With a centerline elevation of the intake pipes at Unit 3 inlet is at -15 ft, there is no risk of vortices and air entrainment in the intake pipe.
- The Technical Specification Limit for the UHS Makeup Water Pump Forebay is ≥ -11.7 feet NGVD 29.

2.4 Hydrologic Engineering
COL Information Item 2.4-13

- A COL applicant will provide site-specific information to identify local and regional groundwater reservoirs, subsurface pathways, onsite use, monitoring or safeguard measures, and to establish the effects of groundwater on plant structures.

➢ Groundwater in the surficial aquifer at the Calvert Cliffs Unit 3 site is aggressive (pH, sulfates, chlorides).

  - This affects structures below the water table. (30’ below power block grade, but not at MWIS).
  - Waterproofing system will protect the portions of the NI and Essential Service Water Buildings (ESWBs) below the groundwater water table.
  - Emergency Power Generating Buildings (EPGBs) are above groundwater table but still protected by a dampproofing system.
  - Duct banks will be protected as necessary.
  - Buried pipe will be protected by wrapping and/or coating.

➢ UHS Makeup water (from Chesapeake Bay) is brackish.

  - Concrete structures subject to brackish water (MWIS and ESWB) will use concrete with a maximum water-cementitious materials ratio of 0.4 and a minimum compressive strength of 5000 pounds per square inch (psi).

2.4 Hydrologic Engineering
COL Information Item 2.4-13

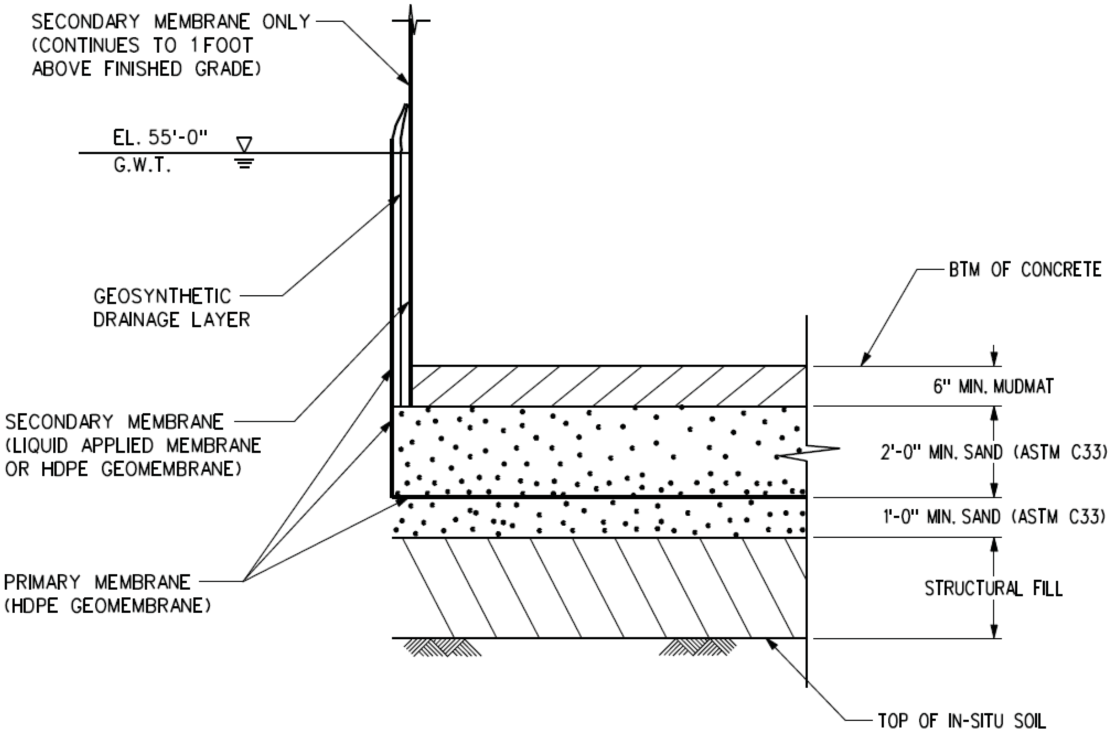
- A COL applicant will provide site-specific information to identify local and regional groundwater reservoirs, subsurface pathways, onsite use, monitoring or safeguard measures, and to establish the effects of groundwater on plant structures. (continued)

- A groundwater monitoring system is provided inside the geo-membrane envelope within the sand layer to monitor and pump out any water that may leak through the primary geo-membrane.
- Throughout the power block area will be monitored:
  - Record baseline pH values, geochemistry concentrations
    - ✓ Prior to start of excavation,
    - ✓ After backfill is completed and
    - ✓ Six month intervals thereafter
  - One-year after backfill is completed:
    - ✓ No negative trend-increase interval of inspection
    - ✓ Negative trend is identified- evaluate need dewatering provisions

2.4 Hydrologic Engineering
COL Information Item 2.4-13

Waterproofing system will protect the portions of the NI and Essential Service Water Buildings (ESWBs) below the groundwater table.

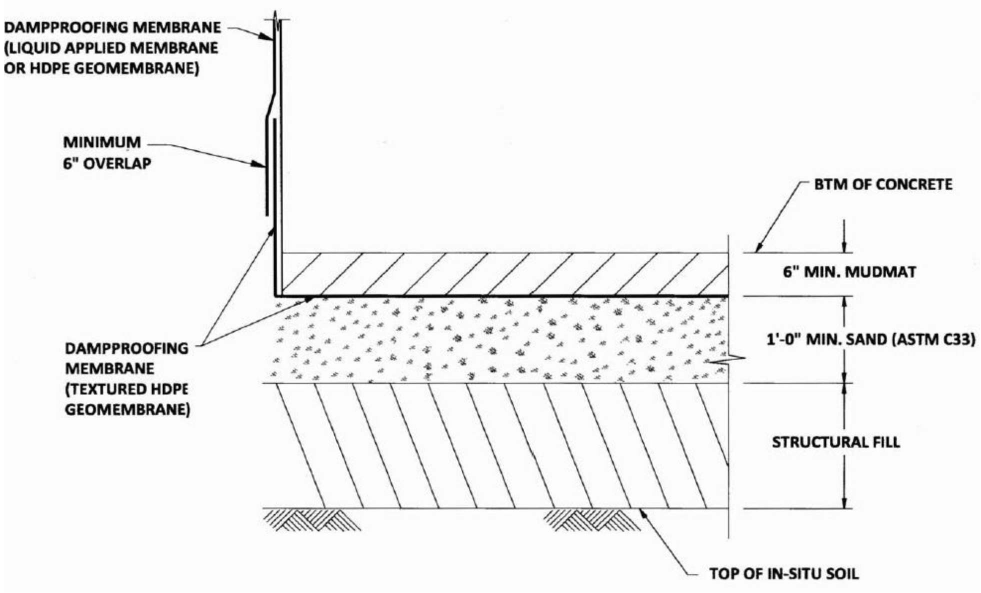
- Waterproofing system
  - Primary and secondary membranes
  - Groundwater monitor system
  - Vertical drainage system placed between primary and secondary systems to facilitate flow of leaked groundwater down to sump pumps



2.4 Hydrologic Engineering
COL Information Item 2.4-13

Dampproofing system will protect the portions of the Emergency Power Generation Buildings (EPGBs) above the groundwater table.

- Dampproofing system
  - EPGBs are above groundwater
  - EPGBs sit on engineered structural fill
  - Exposure from pluvial drainage is low
  - However, HDPE membrane system implemented for defense in depth



2.4 Hydrologic Engineering
COL Information Item 2.4-14

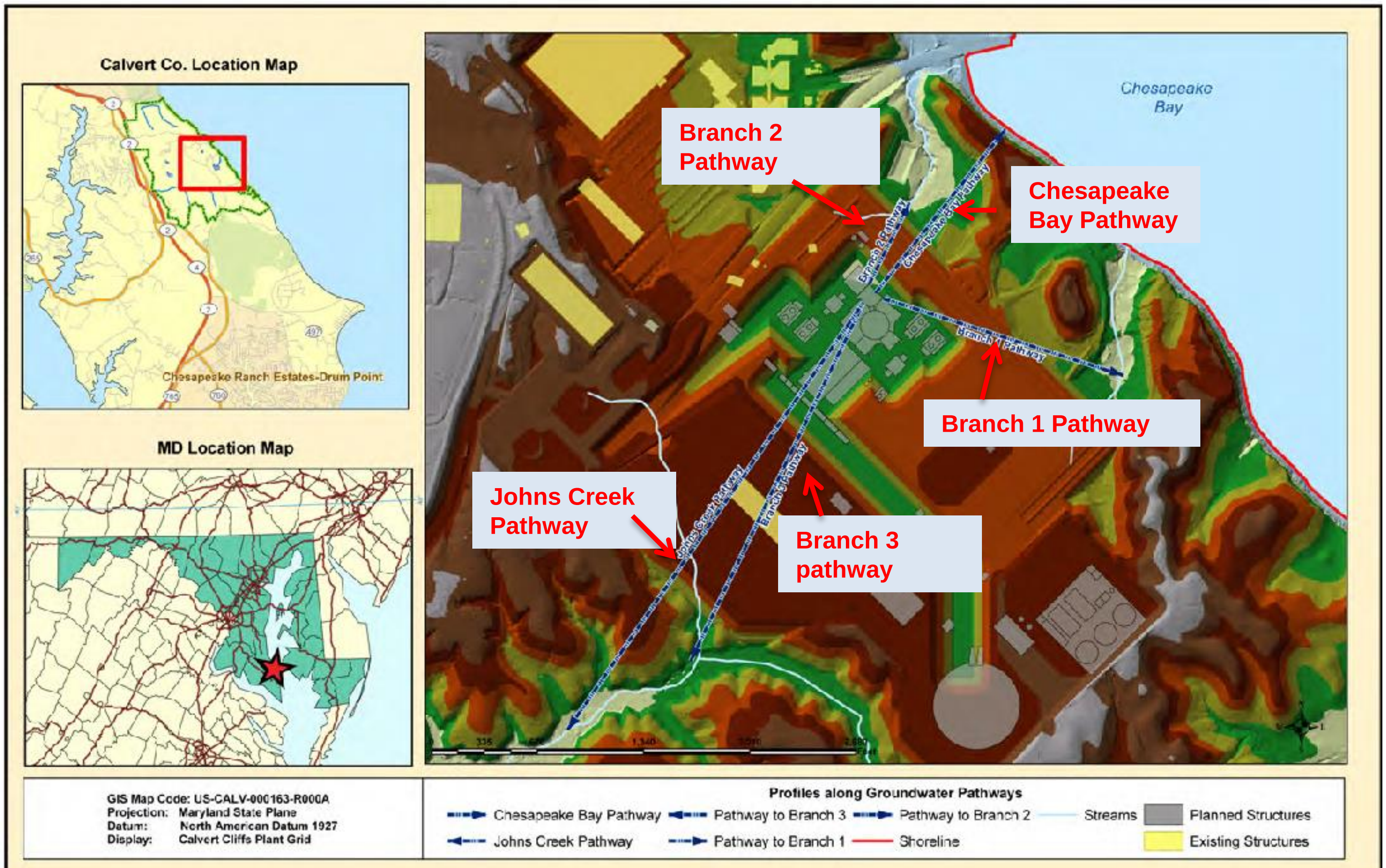
- A COL applicant will provide site-specific information on the ability of the groundwater and surface water environment to delay, disperse, dilute or concentrate accidental radioactive liquid effluent releases, regarding the effects that such releases might have on existing and known future uses of groundwater and surface water resources.

➢ Pathways of Liquid Effluents in Groundwater

- A radionuclide transport analysis has been conducted to estimate the radionuclide concentrations that might impact existing and future water users in the vicinity of CCNPP Unit 3 based on an instantaneous release of the radioactive material contents of a Reactor Coolant Storage Tank (RCST).
- The results of this evaluation indicate the total ingestion exposure is:
  - ✓ 32.58 millirem per year for the pathway through the Upper Chesapeake unit to Branch 2,
  - ✓ 12.42 millirem per year for transport through the Upper Chesapeake unit to Chesapeake Bay,
  - ✓ 73.98 millirem per year for alternative transport through the fill material to Branch 2.
  - ✓ In all cases, the exposure is below the allowable total exposure level to individual members of the public of 100 millirem/yr required in 10 CFR 20.1301 (primary risk drivers are H-3 and I-131).

2.4 Hydrologic Engineering
COL Information Item 2.4-14

Figure 2.4-111— {Plan View of Subsurface Contaminant Pathways}



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2.4 Hydrologic Engineering
COL Information Item 2.4-14

- A COL applicant will provide site-specific information on the ability of the groundwater and surface water environment to delay, disperse, dilute or concentrate accidental radioactive liquid effluent releases, ….. (continued)
- Pathways of Liquid Effluents Surface Water
  - Reactor Coolant Storage Tank and/or Liquid Waste Storage Tank ruptures would flood the lowest levels (-45 ft) of the Nuclear Auxiliary and Waste Buildings, respectively.
  - It is unlikely that a release could reach the ground surface and be capable of impacting surface water.
  - The concrete floor supporting the Volume Control Tank in the Fuel Building is at grade level. However, the room containing this tank is centrally located in the interior of the Fuel Building, and the tank is entirely surrounded by concrete walls.
  - There are no doors providing entry to this room and access is only possible via a ladder through the top of the room. Therefore, a postulated release from the Volume Control Tank will not leave the Fuel Building, reach the ground surface, and impact surface water.

2.4 Hydrologic Engineering
COL Information Item 2.4-14

- A COL applicant will provide site-specific information on the ability of the groundwater and surface water environment to delay, disperse, dilute or concentrate accidental radioactive liquid effluent releases, …… (continued)
- Pathways of Liquid Effluents Surface Water (continued)
  - Two heat exchangers in each of the three Safeguards Buildings are located at grade level.
    - ✓ One Safeguards Building (Building 2/3) houses its grade level heat exchangers within double wall concrete containment, and has no exterior doors leading into the building at grade level.
    - ✓ The remaining Safeguard Buildings (Buildings 1 and 4) do not have double wall containment, and grade level exterior entry doors are present. However, these doorways are designed with six inch concrete thresholds, and the doors are watertight to a flood depth of one meter.
    - ✓ It is unlikely that a release from the grade level heat exchangers in the Safeguard Buildings will reach the ground surface and impact surface water.
  - Because there are no outdoor tanks that could release radioactive effluent, no accident scenario could result in the release of effluent directly to the surface water from outdoor tanks.

2.4 Hydrologic Engineering
COL Information Item 2.4-15

- A COL applicant will describe any emergency measures required to implement flood protection in safety-related facilities and to verify that there is an adequate water supply for shutdown purposes.

➢ Need for Technical Specifications and Emergency Operations Requirements

  - The information provided concludes that there is no need for emergency protective measures designed to minimize the impact of hydrology-related events on safety-related facilities.
  - Therefore, the requirements of 10 CFR50.36, 10 CFR Part 50, Appendix A, General Design Criteria 2, and 10 CFR Part 100 are met with respect to determining the acceptability of the site.
  - In summary:
    - ✓ The worst case low water event does not pose a potential of interrupting the supply of cooling water.
    - ✓ No emergency protective measures are required to minimize the effect of hydrology-related events on safety-related facilities
      - ▪ Confirmation of watertight conditions for the UHS MWIS will be accomplished through routine operator rounds and surveillance of the components comprising the watertight compartments.

2.4 Hydrologic Engineering

CONCLUSIONS

Conclusions

- No Departures and No Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 2.4.
- No ASLB Contentions.
- Fifteen (15) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapters 2.4 FSAR.
- One (1) Confirmatory Item has been identified:
  - ✓ One (1) will be incorporated into revision 10 of the Calvert Cliffs Unit 3 COLA.
- Two (2) SER-Open Items have been identified.

Acronyms

- ACI – American Concrete Institute
- ACRS – Advisory Committee on Reactor Safeguards
- ASCE – American Society of Civil Engineers
- ASLB – Atomic Safety & Licensing Board
- ASME – American Society of Mechanical Engineers
- CCNPP – Calvert Cliffs Nuclear Power Plant
- COL – Combined License
- COLA – COL Application
- CWS – Circulating Water System
- ECL – Effluent Concentration Limits
- EOF – Emergency Operations Facility
- ERC – Estuarine Research Center
- EPGB – Emergency Power Generating Building
- ESWB – Essential Service Water Building
- FSAR – Final Safety Analysis Report
- HEC-HMS – Hydrologic Engineering Center – Hydrologic Modeling System
- HEC-RAS – Hydrologic Engineering
- Center – River Analysis System
- IBR – Incorporate by Reference
- LNG – Liquid Natural Gas
- MWIS – Makeup Water Intake Structure
- NI – Nuclear Island
- NWS – National Weather Service
- PMF – Probable Maximum Flood
- PMH – Probable Maximum Hurricane
- PMP – Probable Maximum Precipitation
- PMSS – Probable Maximum Storm Surge
- PMT – Probable Maximum Tsunami
- psi – pounds per square inch
- RAI – Request for Additional Information
- RCOLA – Reference COL Application
- RCST – Reactor Coolant Storage Tank
- RG – Regulatory Guide
- SB – Safeguards Building
- SCC – Stress Corrosion Cracking
- SER – Safety Evaluation Report
- SLOSH – Sea, Lake, and Overland Surges from Hurricanes
- SPH – Standard Project Hurricane
- SSCs – Structures, Systems and Components
- SSE – Safe Shutdown Earthquake
- UFSAR – Updated Final Safety Analysis Report
- UHS – Ultimate Heat Sink
- USACE – U.S. Army Corps of Engineers

UNISTAR NUCLEAR ENERGY

Presentation to ACRS
U.S. EPR™ Subcommittee
Calvert Cliffs Nuclear Power Plant Unit 3
FSAR Chapter 9, Auxiliary Systems
November 6, 2013

Introduction

- RCOLA authored using 'Incorporate by Reference' (IBR) methodology.
- To simplify document presentation and review, only supplemental information, site-specific information, or Departures/exemptions from the U.S. EPR FSAR are contained in the COLA.
- AREVA U.S. EPR FSAR ACRS Meetings for Chapter 9 – Auxiliary Systems occurred on November 14, 2011 and February 22, 2012.

Introduction

- Three (3) Departures and No Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 9
- No ASLB Contentions
- Thirty Five (35) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 9.

Introduction

- Today Mark Finley, UniStar - President, CEO and CNO, will present the Calvert Cliffs Unit 3 FSAR Chapter 9.
- Today's presentation was prepared by UniStar and is supported by Bechtel, and AREVA.
  - Robert Randall, UniStar – Mechanical Engineering
  - Shankar Rao, Bechtel – Project Engineer
  - Stephen Huddleston, AREVA – Engineering Manager, BOP Systems
- The focus of today's presentation will be on site-specific information that supplements the U.S. EPR FSAR.

Chapter 9 Auxiliary Systems
Agenda

- CHAPTER 9, AUXILIARY SYSTEMS
  - 9.1 FUEL STORAGE and HANDLING SYSTEMS
  - 9.2 WATER SYSTEMS
  - 9.3 PROCESS AUXILIARIES
  - 9.4 AIR CONDITIONING, HEATING, COOLING and VENTILATION SYSTEMS
  - 9.5 OTHER AUXILIARY SYSTEMS
- CONCLUSIONS

Chapter 9
Auxiliary Systems

9.1 FUEL STORAGE and HANDLING SYSTEMS

9.1 FUEL STORAGE and HANDLING SYSTEMS
COL Information Item 9.1-2

- Item 9.2-2: A COL applicant will perform appropriate tests and analyses, which demonstrate that an identified NRC-approved cask can be safely connected to the spent fuel cask transfer facility (SFCTF), and the cask and its adapter meet the criteria specified in U.S. EPR FSAR Table 9.1.4-1, prior to initial fuel loading into the reactor.

➢ Fuel Handling System (License Condition)

- Spent fuel cask transfer facility (SFCTF), and the cask and its adapter will be tested before initial fuel loading, the testing will consist of:
  - ✓ Verify the penetration leak tightness with loading pit filled with water, and
  - ✓ Verify the cask loading sequence and the sequential interlocking with the actual cask and a dummy assembly under water.
- The licensee shall not use the SFCTF for initial cask loading operations until:
  - ✓ The licensee performs the tests, verifies that the results of the tests fall within the acceptance criteria, and
  - ✓ Submits a report to the Director of the Office of New Reactors or the Director's designee.

9.1 FUEL STORAGE and HANDLING SYSTEMS
COL Information Item 9.1-2

U.S. EPR FSAR

Table 9.1.4-1—Spent Fuel Cask Requirements

Type	Requirement
Dimensional Requirements	The dimensions of the cask are less than the following: • Height 5820 mm. • Diameter 2500 mm.
Dose Requirements	Dose rates from a loaded cask during cask handling operations do not exceed those identified in Section 12.3.
Cooling Requirements	The cask shall be capable of dissipating the decay heat from fuel assemblies loaded in the cask without supplemental cooling.
Material Requirements	The materials of construction of the cask are compatible with the operating environment including radiation, heat and borated water.
Support System Requirements	The cask shall have provisions for connecting process lines for water filling and draining, and drying of the cask. The mating surface of the cask maintains a leak-tight connection with the penetration assembly when the cask is connected to the penetration. The piping/valves that connect to the cask and serve as a fluid boundary to the cask loading pit up to and including the first valve (if a normally closed valve), or up to and including a second isolation valve (if a normally open valve with auto close or remote close capability) shall be designed in accordance with ASME Boiler and Pressure Vessel Code, Section III, The American Society of Mechanical Engineers, 2004.
Seismic Requirements	The cask shall be designed to withstand a site-specific safe shutdown earthquake (SSE), with seismic response spectra bounded by the generic response spectra shown in FSAR Figures 3.7.2-110, -111, and -112.
Structural Requirements	The loads transferred to the SFCTF components and FB structures under normal operating conditions are within the following: • Maximum weight of fully loaded cask, including spent fuel assemblies and water, is 115,000 kg. • Distributed loads on the walls of the loading hall do not exceed 25 psf during normal operation. • Distributed loads on the floor of the loading hall do not exceed 200 psf during normal operation. • Total dead weight load of the SFCTM and fully loaded cask on the floor of the loading hall does not exceed 858 kips during normal operation. The loads transferred to the SFCTF components and FB structures under a site-specific SSE and postulated drop of a fuel assembly from the maximum handling height in the cask loading pit onto a connected cask, are within the load capacity of the components and structures, and meet the leakage, dose and cooling requirements listed above.

9.1 FUEL STORAGE and HANDLING SYSTEMS
COL Information Item 9.1-1

- A COL applicant that references the U.S. EPR design certification will provide site-specific information on the heavy load handling program, including a commitment to procedures for heavy load lifts in the vicinity of irradiated fuel or safe shutdown equipment, and crane operator training and qualification.

➢ Overhead Heavy Load Handling System Program

- Procedures address the following:
  - ✓ Identification of any heavy loads and heavy load handling equipment outside the scope of loads described in the U.S. EPR FSAR and the associated heavy load attributes (load weight and typical load path),
  - ✓ Required equipment inspections and acceptance criteria prior to performing lift and movement operations,
  - ✓ Approved safe load paths and exclusion areas, safety precautions and limitations, equipment required for the heavy load lift, and
  - ✓ When heavy loads must be carried directly over the spent fuel pool, reactor vessel or safe shutdown equipment, procedures will limit the height of the load and the time the load is carried.

9.1 FUEL STORAGE and HANDLING SYSTEMS
COL Information Item 9.1-1

- A COL applicant that references the U.S. EPR design certification will provide site-specific information on the heavy load handling program (continued)

➢ Overhead Heavy Load Handling System Program (continued)

  ✓ When heavy loads could be carried (i.e., no physical means to prevent) but are not required to be carried directly over the spent fuel pool, reactor vessel or safe shutdown equipment, procedures will define an area over which loads shall not be carried so that if the load is dropped, it will not result in damage to spent fuel or operable safe shutdown equipment or compromise reactor vessel integrity,

  ✓ Where intervening structures are shown to provide protection, no load travel path is required.

- Inspection and Testing

  ✓ Cranes addressed in U.S. EPR FSAR Section 9.1.5 are inspected, tested, and maintained in accordance with ASME B30.2. Prior to making a heavy load lift, an inspection of the crane is made in accordance with ASME B30.2.

- Training and Qualification

  ✓ Training and qualification of operators of cranes addressed in U.S. EPR FSAR Section 9.1.5 meet the requirements of ASME B30.2.

Chapter 9
Auxiliary Systems

9.2 WATER SYSTEMS

9.2 WATER SYSTEMS
COL Information Item 9.2-4

- A COL applicant will provide a description of materials that will be used for the essential service water system (ESWS) at their site location, including the basis for determining that the materials being used are appropriate for the site location and for the fluid properties that apply.

➢ Essential Service Water (ESW) System Materials

  - The ESWS piping, valves and fittings are made of carbon steel. This is compatible with the normal water chemistry in the UHS tower basin.
  - Carbon Steel buried piping is coated and wrapped and provided with appropriate cathodic protection.
  - The UHS cooling towers are constructed of reinforced concrete, tower fill is constructed of ceramic tile, spray piping and nozzles are fabricated of corrosion resistant materials (e.g., stainless steel, bronze), and the cooling tower basin is made of concrete.
  - Appropriate chemical treatment is used to maintain the quality of water in the basin at an acceptable level to reduce corrosion and scaling, of ESWS components during normal operation.

9.2 WATER SYSTEMS
COL Information Item 9.2-4

- A COL applicant will provide a description of materials that will be used for the essential service water system (ESWS) ….. (continued)

➢ Essential Service Water (ESW) System Materials (continued)

- Under normal operation, the ESWS is exposed to desalinated water treated with corrosion inhibitors.
- During post Design Basis Accident (DBA) scenario, the ESWS may be exposed to brackish water if the nonsafety-related source of desalinated water is unavailable from 72 hours to 30 days after the DBA.
- An evaluation of corrosion rates during the post 30-day DBA scenario has been performed to demonstrate that the ESWS will continue to perform its functions.
- Buried piping has appropriate internal lining (e.g. 2-layer fusion-bonded epoxy, or Type II cement) and external coating (e.g. epoxy).
- Inspection and Testing Requirements
  - ✓Inservice inspection of the ESW System including piping, valves, pumps and components is performed in accordance with the requirements of ASME Section XI and ASME OM Code.
  - ✓The ESW System is designed to permit periodic inspection of components necessary to maintain the integrity and capability of the system to comply with 10 CFR 50 Appendix A, General Design Criterion 45.

9.2 WATER SYSTEMS
Potable and Sanitary Water System
COL Information Item 9.2-2

- A COL applicant will provide site-specific details related to the sources and treatment of makeup to the PSWS along with a simplified piping and instrumentation diagram.

➢ Potable and Sanitary Water System (PSWS)

  - Calvert Cliffs Nuclear power Plant (CCNPP) Unit 3 classifies the system as two systems:
    - ✓ Potable Water System,
    - ✓ Sanitary Water System.

➢ Potable Water System

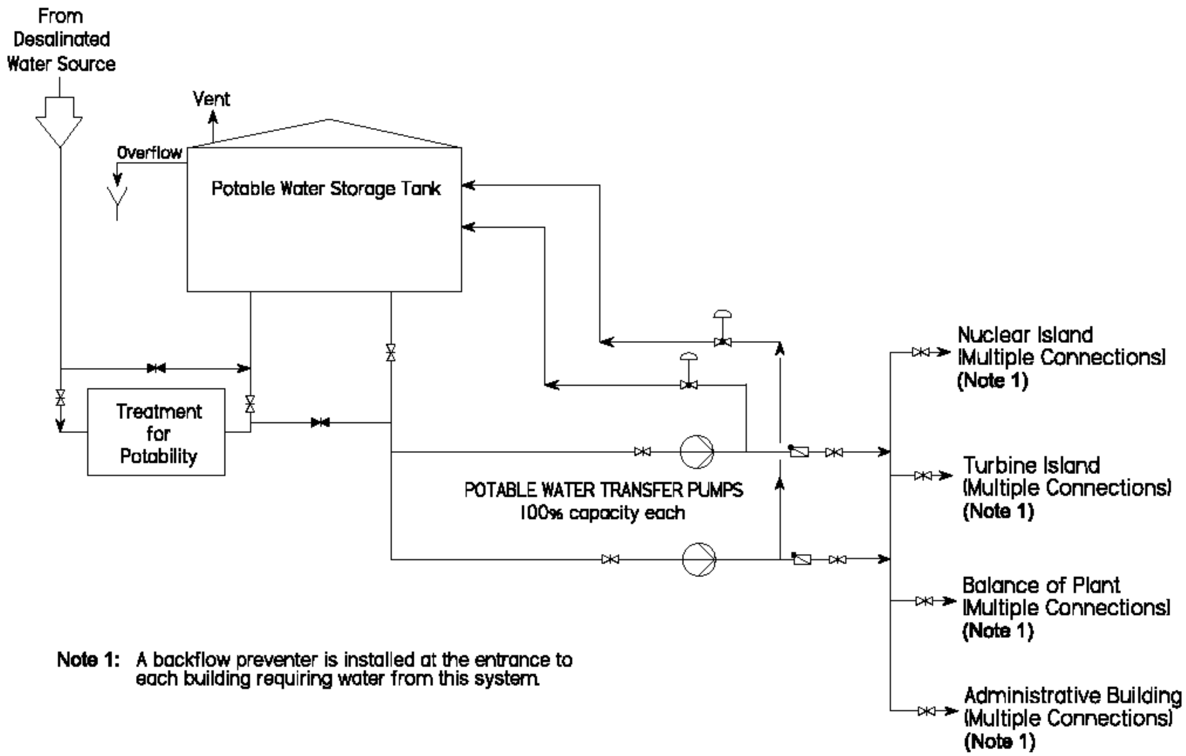
  - Delivers drinking quality water to various points throughout the plant, to individual components and for use as process water in other systems inside the Nuclear Island (NI) and the Conventional Island (CI).
  - Provides potable water at a flow rate sufficient to meet demand and keep potable water pressure above connected equipment's or systems' pressures.

9.2 WATER SYSTEMS
Potable Water System
COL Information Item 9.2-2

- A COL applicant will provide site-specific details related to the sources and treatment of makeup to the PSWS ….. (continued)

➢ Potable Water System (continued)
  - Consists of treatment of incoming water from the desalinization plant for potability.
  - The potability treatment can be bypassed for maintenance, provided appropriate condition of the supply/makeup water from the desalinization plant is confirmed.
  - Branch connections to equipment, including hose bibs, or to other systems are individually isolable and are equipped with backflow preventers to prevent backflow and potential contamination of the Potable Water System.
  - In compliance with Criterion 60 of Appendix A to 10 CFR 50, this system is not connected to any components or other systems that have the potential to carry radiological material.

9.2 WATER SYSTEMS
Potable Water System
COL Information Item 9.2-2



9.2 WATER SYSTEMS
Sanitary Water System
COL Information Item 9.2-2

- A COL applicant will provide site-specific details related to the sources and treatment of makeup to the PSWS ….. (continued)

➢ Sanitary Water System
- Collects water discharged from water closets, urinals, showers, sinks and other sources of sanitary water, with the exception of that from sources within the radiologically controlled area (RCA).
- Sources within the RCA are directed to the Liquid Radwaste System by the Nuclear Island (NI) vents and drains system.
- Some locations within the NI have sanitary waste water streams are directed to the Waste Water Treatment Facility, because they have no connections to systems with the potential to carry radioactive materials.
- Directs waste water via the domestic waste water collection system through the sewage treatment plant for processing.
- Compliance with Criterion 60 of Appendix A to 10 CFR 50, sanitary waste piping in the Access Building leads from the non-RCA through the portion of the Sanitary Waste Water System that collects domestic waste water.
  - ✓ This sanitary waste piping is completely separate from the NI vents and drains system.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System Supplemental Information

- A COL Applicant will provide site specific design information corresponding to U.S. EPR FSAR Figure 9.2.5-2 [[Conceptual Site Specific UHS Systems]].

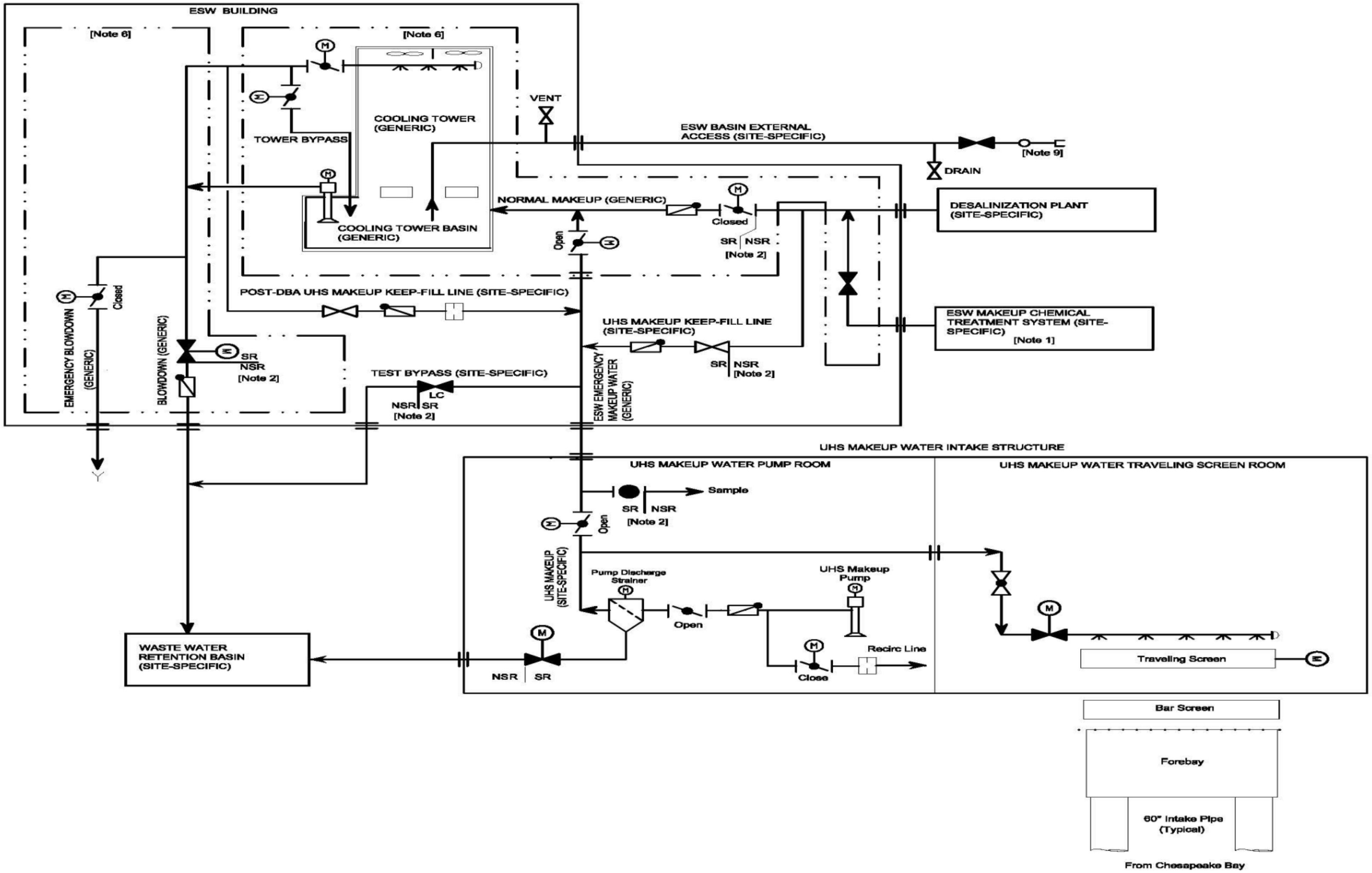
➢ Ultimate Heat Sink (UHS) Makeup System
  - UHS support systems are schematically represented in Figure 9.2-3.
  - For the two operational cooling tower basins, normal essential service water makeup provides a maximum of 660 gpm of desalinated water to replenish UHS inventory losses due to evaporation, blowdown, drift, and provide makeup water to the UHS Makeup Water System to maintain the system full.
  - UHS cooling tower normal blowdown discharges up to 61 gpm of water to the retention basin to maintain ESWS chemistry. This quantity is based on maintaining no more than a ten fold increase in concentration in the cooling tower basin from the concentration in the normal UHS makeup system.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System Supplemental Information

- A COL Applicant will provide site specific design information corresponding to U.S. EPR FSAR Figure 9.2.5-2 [[Conceptual Site Specific UHS Systems]]. (continued)
  - The safety-related UHS Makeup Water pumps provide makeup water to each operating UHS cooling tower basin, starting 72 hours post-accident, at a maximum flow rate of approximately 750 gpm (reduced to approximately 510 gpm when screen wash is operating, 300 gpm required to tower basin).
  - The UHS Makeup Water System is designed to permit periodic inspection of components necessary to maintain the integrity and capability of the system to comply with 10 CFR 50 Appendix A, General Design Criterion 45.
  - The UHS Makeup Water System is designed to permit operational functional testing of safety-related components to ensure operability and performance of the system to comply with 10 CFR 50 Appendix A, General Design Criterion 46.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System

Figure 9.2-3— Normal Makeup, Emergency Makeup, Blowdown & Chemical Treatment



9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-1

- A COL applicant will provide site-specific information for the UHS support systems such as makeup water, blowdown and chemical treatment (to control biofouling).

➢ UHS Makeup Water Chemical Treatment

  - There are chemical additives used in the UHS cooling towers to reduce scaling and corrosion, and to treat potential biological contaminants, which are added via the normal ESWS piping.
  - The treatment system consists of multiple skid-mounted arrangements, one for each division's ESWS cooling tower. Each skid contains the equipment, instrumentation and controls to fulfill the system's function of both monitoring and adjusting water chemistry.
  - Chemical additions to the ESWS cooling towers are made as necessary on a periodic or continuing basis.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-1

- A COL applicant will provide site-specific information for the UHS support systems such as makeup water, blowdown and chemical treatment (to control biofouling). (continued)
  - The specific chemicals and addition rates are determined by periodic water chemistry analyses. The chemicals are divided into six categories, based on function:
    - ✓ biocide - prevents buildup of potentially damaging aquatic life, such as zebra mussels, and controls bacterial growth in the UHS cooling towers (particularly Legionellae).
    - ✓ algaecide - prevents buildup of potentially damaging algae and plant growth.
    - ✓ pH adjuster - counteracts the acidic effects of the algaecide.
    - ✓ corrosion inhibitor - prevents corrosion of piping and components due to saltwater environment and exposure.
    - ✓ scale inhibitor - prevents buildup of scale and mineral deposits that could inhibit process flow.
    - ✓ silt dispersant - prevents buildup of hard silt deposits.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-9

- A COL applicant will compare site-specific chemistry data for normal and emergency makeup water to the parameters in EPR FSAR Table 9.2.5-5. If the specific data for the site fall within the assumed design parameters in Table 9.2.5-5, then the U.S. EPR standard design is bounding for the site. For site-specific normal and emergency makeup water data or characteristics that are outside the bounds of the assumptions presented in Table 9.2.5-5, the COL applicant will provide an analysis to confirm that the U.S. EPR UHS cooling towers are capable of removing the design basis heat load for a minimum of 30 days without exceeding the maximum specified temperature limit of the ESWS and minimum required basin water level.

➢ In a comparison of the Calvert Cliffs Unit 3 site-specific water chemistry with the parameters listed in U.S. EPR FSAR Table 9.2.5-5, it was determined that the site-specific data for both UHS normal (desalinated) makeup water and UHS emergency (Chesapeake Bay) makeup water do not fall within the assumed design parameters of U.S. EPR FSAR Table 9.2.5-5.

➢ For normal operation, the water in the ESW cooling tower basin will be maintained within the specific limits from the U.S. EPR FSAR Table 9.2.5-5 using the chemical addition system.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-9

- A COL applicant will compare site-specific chemistry data for normal and emergency makeup water to the parameters in EPR FSAR Table 9.2.5-5. …. (continued)
  - Regarding Emergency Makeup chemistry outside of the assumed design parameters, an analysis of the UHS Cooling Tower Basin Chemistry indicated that at the end of the thirty (30) days post DBA period :
    - ✓ The Total Dissolved Solids (TDS) concentration of the cooling water in the basin will increase. An analysis of the U.S. EPR UHS Sizing Criteria indicated that the cooling tower heat load decreases significantly after 72 hours post DBA,
    - ✓ An analysis is performed by the prospective cooling tower vendor, which determined that at the end of thirty days, the cooling tower basin water temperature will remain below 95°F with the increased TDS in the basin water and credited reduced cooling tower heat load,
    - ✓ U.S.EPR Tier 1, Table 2.7.11-3, ITAAC 7.9 and 7.10 will confirm the UHS cooling towers are capable of removing the design heat load without exceeding the maximum design temperature and without water level dropping below the minimum design level limit for ESWS.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-5

- A COL applicant will provide a description of materials that will be used for the UHS at their site location, including the basis for determining that the materials being used are appropriate for the site location and for the fluid properties that apply.

➢ UHS Makeup System Materials

- Two buried 60" safety-related pipes from Chesapeake Unit 1 &2 intake channels to the Circulating Water System & UHS common forebay:
  - ✓ Carbon steel pipe lined internally with cement, coated externally with a high solids epoxy.
  - ✓ Additionally, the exterior surface of buried piping exposed to the soil is cathodically protected.
  - ✓ Either pipe can be isolated for maintenance as the other pipe is capable of providing 100% flow.
- The four vertical pumps are designed to ASME Section III, Class 3 requirements:
  - ✓ Constructed of super austenitic stainless steel, which is compatible with the brackish UHS makeup water.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-5

- A COL applicant will provide a description of materials that will be used for the UHS at their site location, including the basis for determining that the materials being used are appropriate for the site location and for the fluid properties that apply.(continued)
  - Isolation valves are safety-related motor operated valves (MOVs) & manual valves are:
    - ✓ Constructed of super austenitic stainless steel.
  - Self-cleaning strainers, one on the discharge side of each UHS Makeup Water pump are:
    - ✓ Constructed of super austenitic stainless steel,
  - The 8" diameter buried and aboveground UHS Makeup Water System piping and fittings that perform safety functions are:
    - ✓ Constructed of super austenitic stainless steel,
    - ✓ Exterior surface of buried piping exposed to the soil is cathodically protected,
    - ✓ Additionally, the piping is flushed quarterly with the brackish Chesapeake Bay water to the retention basin.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-5

- A COL applicant will provide a description of materials that will be used for the UHS at their site location, including the basis for determining that the materials being used are appropriate for the site location and for the fluid properties that apply.(continued)
  - ESWS Cooling Tower Emergency Blowdown System Isolation Valves
    - ✓ Constructed of materials compatible with the brackish UHS emergency makeup water.
  - ESWS Cooling Tower Normal Blowdown System Piping, Valves and Fittings
    - ✓ Constructed of carbon steel material because the normal blowdown is non-brackish water from the normal ESWS makeup system.
  - Screen Wash System Components
    - ✓ Constructed of materials compatible with the brackish UHS emergency makeup water.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-10

- A COL applicant will perform an evaluation of the interference effects of the UHS cooling tower on nearby safety-related air intakes. This evaluation will confirm that potential UHS cooling tower interference effects on the safety related air intakes does not result in air intake inlet conditions that exceed the U.S. EPR Site Design Parameters for Air Temperature as specified in U.S. EPR FSAR Table 2.1-1.

➢ UHS Cooling Tower Interference on Safety-Related Intakes

  - An evaluation has been performed of the interference effects of the UHS cooling tower plumes on nearby safety-related air intakes.
  - The evaluation concluded that there are no adverse effects on the safety functions of the systems, either due to insensitivity to higher wet bulb temperatures or design features that isolate the fresh air intake of the system.
  - For Main Control Room (MCR) and Safeguard Building (SB) Heating Ventilation & Air Conditioning (HVAC), there is sufficient margin in the system to accommodate the minor effects of a small wet bulb temperature increase – determined to be less than 2.5°F by computational fluid dynamics analysis.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-6

- A COL applicant will confirm by analysis of the highest average site-specific wet bulb and dry bulb temperatures over a 72-hour period from a 30-year hourly regional climatological data set that the site-specific evaporative and drift losses for the UHS are bounded by the values presented in Table 9.2.5-3.

➢ Maximum Evaporation and Drift in the Ultimate Heat Sink
  - The U.S. EPR and CCNPP Unit 3 utilize the same 72-hour period of temperature data to determine maximum evaporation of water from the UHS.
  - Therefore, the worst CCNPP Unit 3 meteorological conditions resulting in maximum evaporation and drift loss of water for the UHS over a 72 hour period are bounded by U.S. EPR FSAR Table 9.2.5-3.

9.2 WATER SYSTEMS
COL Information Item 9.2-8

- A COL applicant will confirm that the site-specific UHS makeup capacity is sufficient to meet the maximum evaporative and drift water loss after 72 hours through the remainder of the 30-day period consistent with RG 1.27.

➢ Maximum Evaporation and Drift in the Ultimate Heat Sink

  - The CCNPP Unit 3 UHS Makeup Water System provides ≥ 300 gpm, of makeup water to the each of the four UHS Cooling Tower basin starting 72 hours post DBA, as required by U.S. EPR FSAR Table 9.2.5-2.
  - The CCNPP Unit 3 UHS Makeup Water pumps are sized to provide a maximum of approximately 750 gpm to the UHS Cooling Tower basin.
    - ✓ This flow is sufficient to provide the minimum required flow even when the intermittent traveling screen wash and the intermittent strainer wash systems are operating.
    - ✓ Maintain the water level in the UHS Tower basin above the minimum water level for the ESW pump Net Positive Suction Head (NPSH) and Vortex Suppression, considering the maximum evaporation and drift loss after 72 hours and up to 30 days post DBA.

9.2 WATER SYSTEMS
COL Information Item 9.2-8

- A COL applicant will confirm that the site-specific UHS makeup capacity is sufficient to meet the maximum evaporative and drift water loss after 72 hours through the remainder of the 30-day period consistent with RG 1.27. (continued)

➢ Maximum Evaporation and Drift in the Ultimate Heat Sink (continued)

  - The U.S. EPR design 72-hour meteorological conditions resulting in maximum evaporation and drift from the UHS Cooling Tower, are depicted in U.S. EPR FSAR Table 9.2.5-3.
  - This data is identical to the CCNPP Unit 3 values for the 72-hour meteorological conditions, resulting in identical maximum evaporation and drift loss.
  - Therefore, the CCNPP Unit 3 UHS Makeup water capacity is bounded by U.S. EPR Makeup Water capacity, to meet the maximum evaporation and drift loss starting 72 hours post DBA through the remainder of the 30 day period.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
COL Information Item 9.2-7

- A COL applicant will confirm that the site characteristic sum of 0% exceedance maximum non-coincident wet bulb temperature and the site-specific wet bulb correction factor does not exceed the value provided in U.S. EPR FSAR Table 9.2.5-2. If the value in Table 9.2.5-2 is exceeded, the maximum UHS cold-water return temperature of 95°F is to be confirmed by analysis.

➢ The maximum non-coincident wet bulb temperature plus the site-specific wet bulb correction factor for Calvert Cliffs 3 exceeds the value provided in U.S. EPR FSAR Table 9.2.5-2, and, therefore, a site specific analysis was done:
  - The U.S. EPR FSAR Table 9.2.5-2 value is 81°F, and the correction factor is 2.5°F.
  - The site-specific maximum (0% exceedance) non-coincident wet bulb temperature is 85.3°F.
  - The site-specific wet bulb correction factor was determined by computational fluid dynamics analysis, considering the meteorology of the site, to be less than 2.5°F.
  - UHS cooling tower performance was verified by showing that the maximum UHS cold water return temperature was less than 95°F, assuming the worst combination of 24-hour temperature conditions from the perspective of minimum cooling from a 30-year hourly regional climatological data set, and assuming a correction factor of 2.5°F.

9.2 WATER SYSTEMS
Ultimate Heat Sink (UHS) Makeup System
Shifting of Twenty-Four (24) Hour Peak Ambient Temperature Profile
Departure/COL Information Item 9.2-11

- A COL applicant will confirm that the maximum UHS cold-water return temperature of 95°F is met by an analysis that confirms that the worst combination of site-specific wet bulb and dry bulb temperatures over a 24-hour period, from a 30-year hourly regional climatological data set is bounded by the values presented in Table 9.2.5-4.

➢ Departure
  - The limiting climatological data set is the same for Calvert Cliffs Unit 3 as in US EPR FSAR Table 9.2.5-4, but the data has been conservatively shifted by six hours to align the timing of the peak ambient temperature with the peak heat discharged during a large break LOCA.
  - As stated previously, a site-specific analysis was performed to confirm the maximum UHS cold water return temperature is less than 95°F for the worst conditions at the site during the worst demand scenario – large break LOCA.
  - AREVA intends to update the US EPR FSAR and make a similar shift in the U.S. EPR FSAR Table 9.2.5-4 data in a future revision to the US EPR FSAR, and this departure will be removed when the US EPR FSAR is updated.

9.2 WATER SYSTEMS

UHS Makeup Water Pump Starting Logic Departure

- UHS Makeup Water Pump Starting Logic
  - The UHS Makeup Water System at CCNPP Unit 3 is a manually initiated system.
  - This departure was based on U.S. EPR FSAR, Tier 2 Table 9.2.1-3, Revision 4 wording for the pump start permissive associated with "Cooling tower basin water level Lo-Lo-Lo”.
  - The Revision 4 wording incorrectly included a condition that could have precluded starting the Makeup Water Pump.
  - The U.S. EPR FSAR, Tier 2 Table 9.2.1-3, Revision 5, corrected this wording .
  - This departure is no longer needed and will be removed in the next CCNPP Unit 3 Combined License Application (COLA) revision.

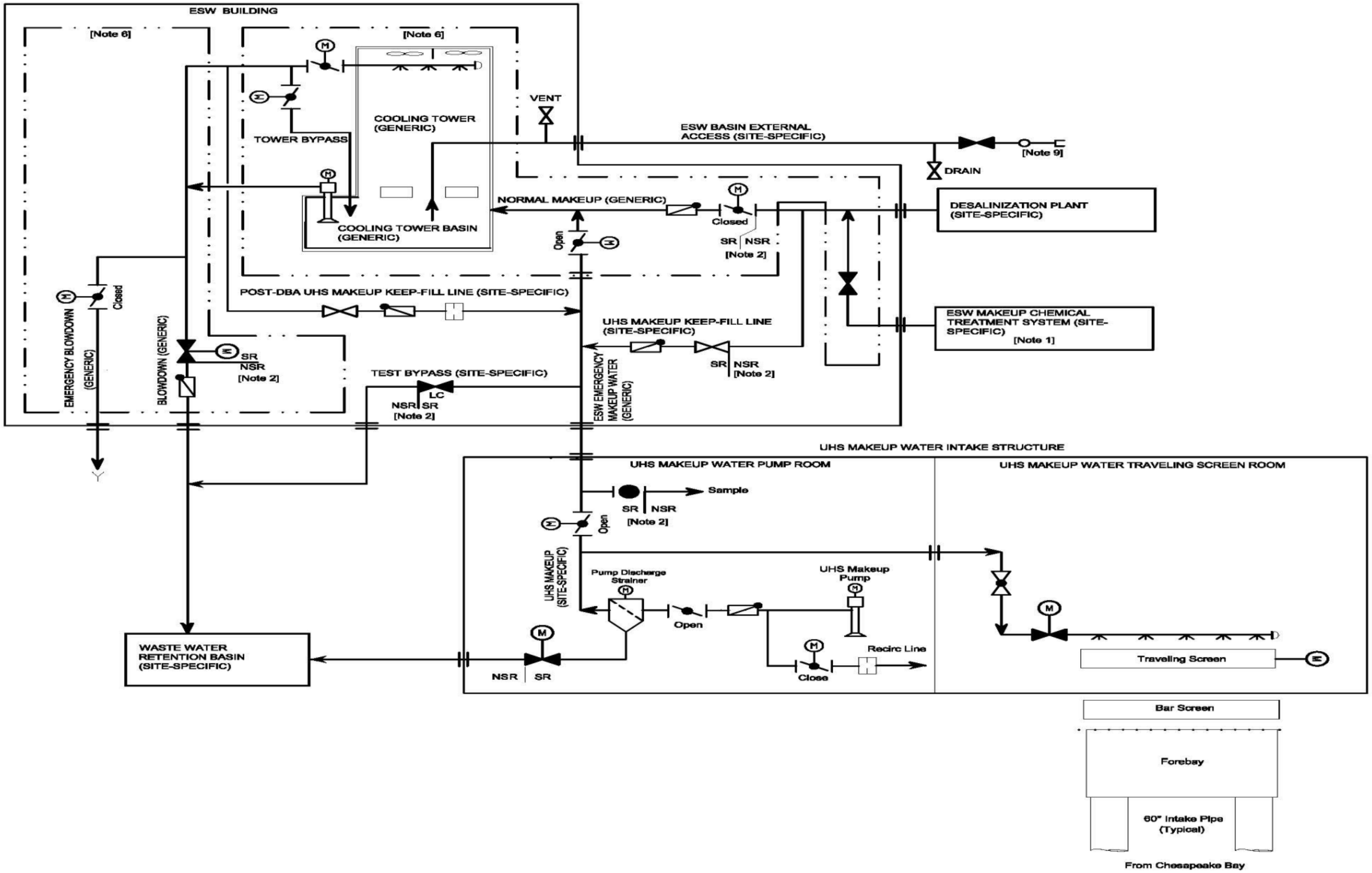
9.2 WATER SYSTEMS
Post-DBA UHS Makeup Keep-Fill Piping Departure

- Post-DBA UHS Makeup Keep-Fill Piping
  - The U.S. EPR Figure 9.2.5-1 does not contain a provision to compensate for the UHS Makeup Water System leakage and maintain the water level in the piping full at all times.
  - The normal UHS makeup keep fill system is designed to provide desalinated water to maintain UHS makeup system full during normal plant operation.
  - The Post-DBA UHS Makeup Keep-Fill line is added to deliver makeup water from the ESWS to the UHS Makeup Water System to compensate for the leakage loss due to pressure boundary isolation valves, and to keep the UHS Makeup Water System piping full of water at all times.
  - Therefore, the ESWS Emergency Makeup Water line piping and the ESW System return line piping are modified.
  - The UHS Makeup Water System pressure boundary is maintained through the safety-related Post-DBA UHS Makeup Keep-Fill line check valve.

9.2 WATER SYSTEMS

Ultimate Heat Sink (UHS) Makeup System

Figure 9.2-3— Normal Makeup, Emergency Makeup, Blowdown & Chemical Treatment



9.2 WATER SYSTEMS
COL Information Item 9.2-3

- The Raw Water Supply System (RWSS) and the design requirements of the RWSS are site-specific and will be addressed by the COL applicant..

➢ Raw Water Supply System (RWSS)

  - RWSS is Nonsafety-Related.
  - Raw water is supplied from the Circulating Water System Makeup Water System (which draws water from the Chesapeake Bay) and is directed to the desalinization plants.
  - The desalinization plant output is stored in storage tanks and delivered to the demineralized and potable water generation systems, to the fire water storage tanks and to the essential service water cooling tower basins.
  - No cross connections exist between RWSS and any system with the potential to carry radioactive material. This design requirement satisfies Criterion 60 of Appendix A to 10 CFR 50.
  - With respect to potential flooding caused by failures of piping or components, the RWSS piping is designed to preclude adverse interaction with the safety function of the ESWS cooling tower basin.

9.2 WATER SYSTEMS
COL Information Item 9.2-3

- The Raw Water Supply System (RWSS) and the design requirements of the RWSS are site-specific and will be addressed by the COL applicant. (continued)

➢ Raw Water Supply System (RWSS) (continued)

  - RWSS storage tank failures will not adversely affect safety-related Structures, Systems and Components (SSCs), because intervening topography and the plant storm water controls are designed to divert surface water flow away from these SSCs.

Chapter 9
Auxiliary Systems

9.3 PROCESS AUXILIARIES

9.3 PROCESS AUXILIARIES

- Process Auxiliaries
  - This section of the U.S. EPR FSAR is completely incorporated by reference, with no COL Items, or site-specific supplemental information.
    - ✓ Systems are:
      - Compressed Air,
      - Process Sampling,
      - Equipment and Floor Drainage,
      - Chemical and Volume Control.

9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS

9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS
COL Information Item 9.4-1

- A COL applicant will provide site-specific design information for the turbine building ventilation system (TBVS).

➢ Turbine Building Ventilation System (TBVS)

  - Does not serve any safety-related functions, has no safety design basis, and is not required to operate during or following a design basis accident. There are no safety-related SSCs in the Turbine Building.
  - The TBVS maintains the bulk average temperature within the Turbine Building during normal plant operation at or above 50°F during winter design conditions and at or below 115°F during summer design conditions.
  - The system is designed to maintain a positive pressure to mitigate intrusion of dust and dirt into the Turbine Building.
  - There are no radiation or safety actuation signals associated with the TBVS. No TBVS realignment or operator action is required in response to plant radiation or safety actuation signals.

9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS
COL Information Item 9.4-2

- A COL applicant will provide site-specific design information for the switchgear building ventilation system (SWBVS).

➢ Switchgear Building Ventilation System (SWBVS) Turbine Island

  - Does not serve any safety-related functions, has no safety design basis, and is not required to operate during or following a design basis accident. There are no safety-related SSCs in the Switchgear Building.
  - The station blackout (SBO) diesel generators divisions 1 & 2 and associated electrical equipment are located inside the Switchgear Building. Ventilation is provided to the SBO rooms by an independent ventilation system, not by the SWBVS.
  - The independent station blackout room ventilation system is described in U.S. EPR FSAR Section 9.4.10.
  - There are no radiation or safety actuation signals associated with the SWBVS. No SWBVS realignment or operator action is required in response to plant radiation or safety actuation signals.

9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS
Supplemental Information

- UHS Makeup Water Intake Structure Ventilation System
  - The UHS Makeup Water Intake Structure Ventilation System maintains a minimum temperature of 41° F and a maximum temperature of 104° F in the UHS Makeup Water Intake Structure,
    - ✓ Based on the 0% exceedance winter design basis outdoor ambient air temperature of 0°F DB, and the 0% exceedance summer design-basis outdoor ambient air temperatures of 102°F DB/ 80°F WB, respectively.
  - The UHS Makeup Water Intake Structure Ventilation System consists of three (3) sub-systems: the UHS makeup pump room and transformer room ventilation system, the Intake Structure personnel access areas ventilation system, and the traveling screen room ventilation system.
    - ✓ Nonsafety-related supply and exhaust fans are provided to heat and ventilate the intake structure personnel access areas corridors. Both supply and exhaust openings are provided with tornado dampers.

9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS
Supplemental Information

- UHS Makeup Water Intake Structure Ventilation System (continued)
  - ✓ A safety-related split-system air conditioner is provided to cool and ventilate each UHS Makeup Water System pump and transformer room.
    - Each air conditioning system recirculates room air and draws outside air to ventilate the rooms.
    - The supply air flow path includes a missile-protected outside air intake, tornado damper, and an outside air makeup connection to the safety-related air handling unit, ducted from the air-cooled condenser room.
    - The air-cooled condenser room forms the supply air plenum for the air-cooled condenser and the makeup air supply.
  - ✓ Each traveling screen room is ventilated by a safety-related exhaust fan which draws outside air through a missile protected outside air intake, tornado damper and motor operated isolation damper.
    - A safety-related unit heater is provided in each traveling screen room to maintain the minimum required temperature of 41°F in the winter.

9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS
Supplemental Information

- Fire Protection Building Ventilation System
  - Located in the two, 100% capacity diesel engine driven pump rooms, is an augmented quality system designed to be functional post-Safe Shutdown Earthquake (SSE).
  - The ventilation system in the electric motor driven pump room is a non-seismic, augmented quality system.
  - The Fire Protection Building Ventilation System maintains a minimum temperature of 40°F, based on an ambient temperature of -10°F, and a maximum temperature of 120°F, based on an outside ambient temperature of 100°F.
  - Using outside air as the cooling medium.
  - Includes a self-contained Standby Diesel Generator (SDG) to supply AC power to the components of the ventilation system, heating system, and normal and emergency lighting systems, for the two diesel engine driven pump rooms following a SSE and loss of offsite power (LOOP) or Station Blackout (SBO).
    - ✓ The SDG will provide AC power for twenty four hours, and thereafter it can provide AC power continuously by refueling the diesel engine, if the power is not restored within 24 hours.

Chapter 9
Auxiliary Systems

9.5 OTHER AUXILIARY SYSTEMS

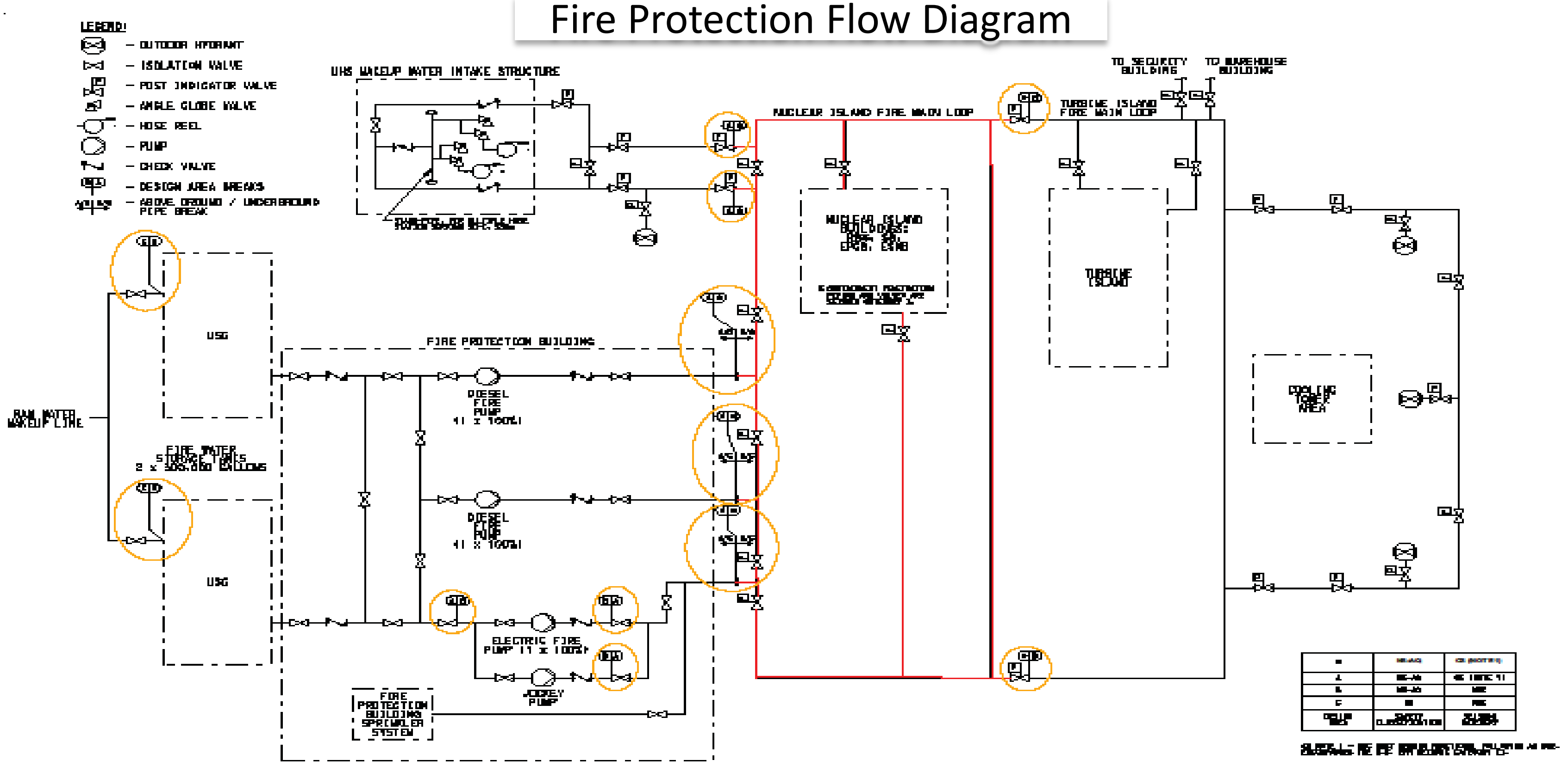
9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Item 9.5-19

- A COL applicant will provide a description and simplified Fire Protection System piping and instrumentation diagrams for site-specific systems..

➢ Fire Protection System
  - Figure 9.5-1, Figure 9.5-2 and Figure 9.5-3 each provide a schematic piping and instrumentation diagram of the fire water distribution system specific to CCNPP Unit 3. These figures supplement the generic piping and instrumentation diagram provided in Figure 9.5.1-1 of the U.S. EPR FSAR.
  - Figure 9.5-1 illustrates the site-specific fire main yard loop supplying the Cooling Tower area. This non-seismic loop supplies the sprinkler system protecting the Water Treatment Building as well as the yard fire hydrants.
  - Figure 9.5-2 illustrates the site-specific fire main yard loop supplying the Intake Structure area. The loop remains functional after a SSE and supplies fire water to the above ground manual and automatic suppression systems.
  - Figure 9.5-3 illustrates the standpipe and hose stations, designated as Conventional Seismic-I, specified for the UHS Makeup Water Intake Structure.
  - A consolidated fire protection system loops are depicted in the next figure.

9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Item 9.5-19

Fire Protection Flow Diagram



9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Item 9.5-14

- A COL applicant will submit site-specific information to address the Regulatory Guide 1.189, Regulatory Position C.6.2.6, Cooling Towers.

➢ Fire Protection System

  - The Circulating Water Cooling Tower (CWCT) is remotely located such that a fire will not adversely affect any systems or equipment important to safety.
  - Fire protection features provided to protect the CWCT include a dedicated, underground, fire protection yard loop which surrounds the CWCT, and yard hydrants located in accordance with NFPA 24.
  - The CWCT yard loop is supplied from two independent supply lines from the main fire water distribution system underground yard loop.
  - Other fire protection features provided include automatic fire detection, manual fire alarms and portable fire extinguishers.

9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Item 9.5-20

- A COL applicant will describe the program used to monitor and maintain an acceptable level of quality in the fire protection system freshwater storage tanks.

➢ Fire Protection System

- The fire protection water supply quality program will ensure the criteria in Regulatory Guide 1.189, Section 3.2.1, are met as follows:
  - ✓ Storage tank makeup is supplied from the desalinization plant which ultimately draws suction from the Chesapeake Bay.
  - ✓ The fire protection water supply is treated to potable quality to help prevent occurrence of biological fouling or corrosion by means of desalination and chemical treatment.
  - ✓ In addition to water treatment, the fire water storage tanks are inspected periodically for biological growth and subsequent corrosion.
  - ✓ Fire service mains, fire hydrants and fire suppression systems are also flow tested and/or drained periodically to verify treatment success and to confirm system functionality.
  - ✓ The rate of makeup flow to the fire water storage tanks is sufficient to refill the minimum fire protection volume in one tank within eight hours.

9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Item 9.5-18

- A COL applicant will perform a supplemental Fire Protection Analysis for site-specific areas of the plant not analyzed by the FSAR.

➢ Fire Protection System

  - Appendix 9B addresses the fire protection analysis for the site-specific structures.
  - In addition, the plant will maintain an integrated fire hazards analysis (FHA) and supporting evaluations that demonstrate that the plant can:
    - ✓ Achieve and maintain post-fire safe shutdown conditions for a fire in any fire area of the plant, including alternative shutdown fire areas,
    - ✓ Maintain safe plant conditions and minimize potential release of radioactive material in the event of a fire during any plant operating mode,
    - ✓ Detail the plant fire prevention, detection, suppression, and containment features, for each fire area containing structures, systems and components (SSCs) important to safety, and
    - ✓ Achieve and maintain these safe conditions with due consideration of plant fire risk.

9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Items 9.5-2, 9.5-3 & 9.5-4

- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.1.7.1, Design and Procurement Document Control.
- ➢ Design and Procurement Document Control shall be in accordance with the Quality Assurance Program Description. Fire protection quality requirements are included in plant configuration control processes.
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.1.7.2, Instructions, Procedures and Drawings.
- ➢ The FPP provides instruction and procedures to control fire prevention and firefighting; design, installation, inspection, test, maintenance and modification of fire protection features/systems; and appropriate administrative controls in accordance with the Quality Assurance Program Description.
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.1.7.3, Control of Purchased Material, Equipment, and Services.
- ➢ The FPP provides procedures to control procurement of fire protection related items to ensure proper evidence of quality in accordance with of the Quality Assurance Program Description.

9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Items 9.5-5, 9.5-6, 9.5-7 & 9.5-8

- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.1.8, Fire Protection Program Changes/Code Deviations.
  - ➢ Fire Protection Program (FPP) changes or deviations will be assessed in accordance with existing regulatory guidance (i.e., NUREG-0800, SRP 9.5.1 and R.G. 1.189).
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.1.8.1, Change Evaluations.
  - ➢ FPP program changes will be evaluated consistent with 10 CFR 50.59 and the applicable change processes in 10 CFR 52.
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.1.8.5, 10 CFR 50.72 Notification and 10 CFR 50.73 Reporting.
  - ➢ The plant will report fire events and any fire protection program deficiencies consistent with 10 CFR 50.72 and 10 CFR 50.73.
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.1.8.7, Fire Modeling.
  - ➢ If fire models are used to evaluate changes, the plant will apply models consistent with R.G. 1.189 including limitations on their use and adequate verification and validation (as required).

9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Items 9.5-9, 9.5-10, 9.5-11 & 9.5-12

- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.5.5, Post-Fire Safe- Shutdown Procedures.
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.5.5.1, Safe- Shutdown Procedures.
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.5.5.2, Alternative/ Dedicated Shutdown Procedures.
- ➢ The plant will have detailed procedures and training to ensure fire-safe shutdown and other fire-safe conditions required to minimize radioactive material release are achieved and maintained.
- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.5.5.3, Repair Procedures.
- ➢ Consistent with the U.S. EPR FSAR, the plant does not permit repairs to achieve hot or cold shutdown conditions; procedures are not required.

9.5 OTHER AUXILIARY SYSTEMS
Fire Protection
COL Information Items 9.5-13 & 9.5-15

- A COL applicant will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.6.2.4, Independent Spent Fuel Storage Areas.
  - ➢ No Independent Spent Fuel Storage Areas are planned for the plant at this time and are not included in this COL application.
- A COL will submit site specific information to address Regulatory Guide 1.189, Regulatory Position C.7.6, Nearby Facilities.
  - ➢ Appendix 9A of the U.S. EPR FSAR provides the technical analysis for the nuclear island and related power block structures and demonstrates that the EPR has the ability to achieve and maintain safe-shutdown and to minimize the release of radioactive materials to the environment.
  - ➢ FSAR Appendix 9B of this COL application provides an analysis of fire hazards and details fire protection attributes for the remainder of the plant.

9.5 OTHER AUXILIARY SYSTEMS
Communication System
COL Information Item 9.5-21

- A COL applicant will provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface.

➢ Communication System

- The emergency off-site communication system provides interface between the on-site and off-site communication systems to allow dedicated communication access to Emergency Operations Facility (EOF), NRC, and federal and state/local agencies.
- This system is designed to be compatible with on-site communication systems.
- The emergency off-site communication system is powered from a Class 1E Uninterruptible Power Supply (UPS) system.
- Interfaces to the plant security system are addressed in the Physical Security Plan.
- The Emergency Notification System (ENS) is powered locally from either a safety-related or non safety-related power source with a UPS, having either battery or generator backup.

9.5 OTHER AUXILIARY SYSTEMS
Communication System
COL Information Item 9.5-21

- A COL applicant will provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface. (continued)

➢ Communication System
  - The ENS is routed through the site Private Branch Exchange (PBX) to provide access to multiple outbound call paths.
  - The long distance portion of the system is provided by the NRC using direct access lines (DALs) to the federal long distance service directed through a toll-free (800/888) exchange.

9.5 OTHER AUXILIARY SYSTEMS
Communication System
COL Information Item 9.5-1

- The COL applicant will identify additional site-specific communication locations necessary to support effective communication between plant personnel in all vital areas of the plant during normal operation, as well as during accident conditions.

➢ Communication System

  - The UHS Makeup Water Intake Structure contains safety-related equipment and is a site-specific vital area of the plant.
  - Communication equipment will be provided in this area to support effective communication between plant personnel during normal operation, as well as during accident conditions.
  - This location will contain equipment to allow use of the plant digital telephone system, PA and alarm system, and sound powered system.
  - All the communication subsystems are available for use during normal operation of the plant.
  - The communication subsystems are powered from the Class 1E Emergency Uninterruptible Power Supply System (EUPS) or the Class 1E Emergency Power Supply System (EPSS).
  - A portable wireless communication system will also be provided for use by fire brigade and other operations personnel required to achieve safe plant shutdown.

9.5 OTHER AUXILIARY SYSTEMS
Diesel Generator Fuel Oil Storage and Transfer System
COL Information Item 9.5-22

- A COL applicant will describe the site-specific sources of acceptable fuel oil available for refilling the EDG fuel oil storage tanks within seven days, including the means of transporting and refilling the fuel storage tanks, following a design basis event to enable each diesel generator system to supply uninterrupted emergency power.

➢ Diesel Generator Fuel Oil
  - Calvert Cliffs Unit 3 has multiple sources of fuel oil that may be brought in by truck, barge, or air.
  - Relationships or points of contact with the entities which are the sources of the fuel oil and the means for its transportation are well established.
  - Multiple sources and means of transportation allow for the flexibility necessary in order to best respond to an event, and provides assurance of the ability to deliver fuel oil to the site.

Chapter 9
Auxiliary Systems

CONCLUSIONS

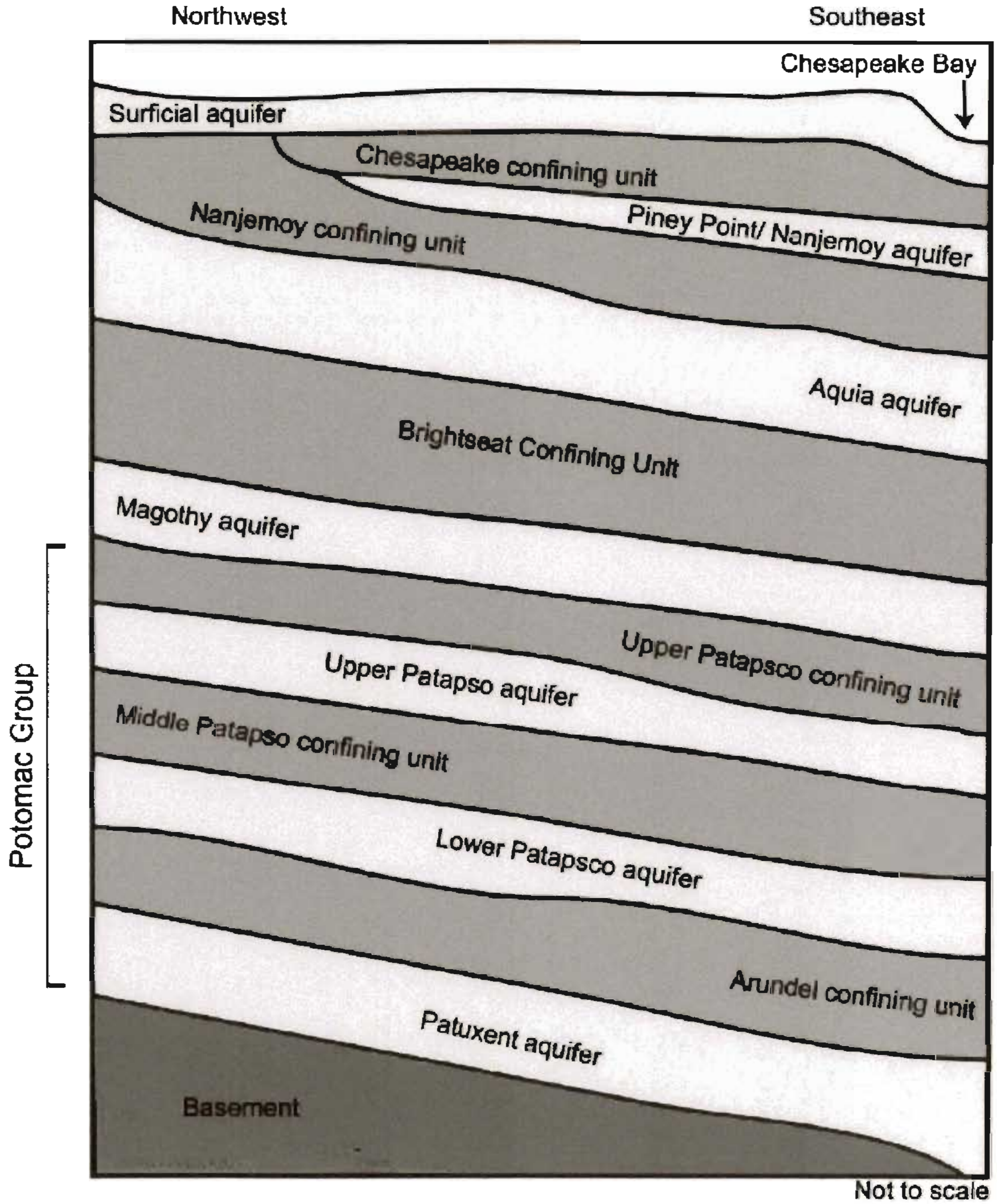
Conclusions

- Three (3) Departures and No Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 9.
- No ASLB Contentions.
- Thirty Five (35) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 9 FSAR.
- Thirteen (13) Confirmatory Items have been identified.
  - ✓ Four (4) have been incorporated into the COLA as of revision 9, and
  - ✓ Nine (9) will be incorporated into revision 10 of the Calvert Cliffs Unit 3 COLA.
- Four (4) SER-Open Items have been identified.

Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- ASCE – American Society of Civil Engineers
- ASLB – Atomic Safety & Licensing Board
- ASME – American Society of Mechanical Engineers
- CCNPP – Calvert Cliffs Nuclear Power Plant
- CI – Conventional Island
- COL – Combined License
- COLA – COL Application
- CWCT – Circulating Water Cooling Tower
- DALs – direct access lines
- DBA – Design Basis Accident
- DOE – Department of Energy
- ECL – Effluent Concentration Limits
- ENS – Emergency Notification System
- EOF – Emergency Operations Facility
- EPGB – Emergency Power Generating Building
- EPRI – Electric Power Research Institute
- LOCA – Loss of Coolant Accident
- LOOP – loss of offsite power
- EPSS – Emergency Power Supply System
- ESWS – Essential Service Water System
- ESWB – Essential Service Water Building
- EUPS – Emergency Uninterruptible Power Supply System
- FHA – fire hazards analysis
- FPP – Fire Protection Program
- FSAR – Final Safety Analysis Report
- HVAC – Heating Ventilation & Air Conditioning
- IBR – Incorporate by Reference
- ITAAC – Inspection, Test, Analysis and Acceptance Criteria
- LOCA – Loss of Coolant Accident
- LOOP – loss of offsite power
- MOVs – motor operated valves
- MCR – Main Control Room
- MWIS – Makeup Water Intake Structure
- NAB – Nuclear Auxiliary Building
- NI – Nuclear Island
- NPSH – Net Positive Suction Head
- PBX – Private Branch Exchange
- PSWS – Potable and Sanitary Water System
- RAI – Request for Additional Information
- RCA – Radiologically Controlled Area
- RCOLA – Reference COL Application
- RWSS – Raw Water Supply System
- SB – Safeguards Building
- SBO – station blackout
- SDG – Standby Diesel Generator
- SER – Safety Evaluation Report
- SFCTF – Spent fuel cask transfer facility
- SPH – Standard Project Hurricane
- SSC – Seismic Source Characterization
- SSCs – Structures, Systems and Components
- SSE – Safe Shutdown Earthquake
- SSI – Soil Structure Interaction
- SWBVS – Switchgear Building Ventilation System
- TBVS – Turbine Building Ventilation System
- TDS – Total Dissolved Solids
- UHS – Ultimate Heat Sink
- UPS – Uninterruptible Power Supply

Attachment 1A: Aquifer Levels Diagram (1 Sheet)



(Source of Information Documented in Ref. 7)

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Presentation to the ACRS Subcommittee

Calvert Cliffs Unit 3 Combined License Application Review
Safety Evaluation with Open Items

Chapter 2, Section 2.4:
"Hydrologic Engineering"

November 6, 2013

Review Team

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CCNPP COL CHAPTER 2.4 – HYDROLOGIC ENGINEERING

Reviewers/Presenters

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Summary of Review

- **Conclusions and Status of SE Chapter 2.4**
  - FSAR met regulatory requirements
  - Currently tracked items: One open item and one confirmatory item related to SE Chapter 2.4
  - One new open item (RAI 400 with two questions) identified
    - Inconsistent Depiction of CCNPP Unit 3 Site Boundary
    - Estimate of Bounding Value for Subsidence Resulting from Plant Groundwater Use

CURRENTLY TRACKED ITEMS

Existing RAI 222, Question 01-5
U.S. EPR Design Certification

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- The staff is reviewing the information in the U.S. EPR FSAR on Docket No. 52-020.
- The results of the staff's technical evaluation of the information related to the characteristics of the site, incorporated by reference in the COL FSAR, will be documented in the staff FSER on the design certification application for the U.S. EPR.
- The staff notes that the FSER on the U.S. EPR is not yet complete.
- The staff will update Section 2.4.1 of the COL to reflect the final disposition of the design certification application.

Existing RAI 389, Question 02.04.03-1
PMF Calculation Typographical Errors

- The COL applicant identified minor typographical errors in the COL FSAR Revision 8.
- The staff reviewed these changes and determined that the staff's independent PMF calculations were similar to the COL applicant's in terms of peak discharges and water-surface elevations.
- Both the COL applicant's and the staff's estimates of peak water-surface elevations were significantly lower than the safety-related plant grade (25.8 m (84.6 ft) NGVD29).
- This item is being tracked as a confirmatory item to ensure the next revision of the COL FSAR is updated to address the minor typographical errors at the site.

NEW OPEN ITEMS

New RAI 400, Question 02.04-1
Inconsistent Depiction of CCNPP Unit 3 Site Boundary

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- FSAR Revision 9 Figure 2.4-1 shows the outline of the CCNPP Unit 3 site boundary that appears to be inconsistent with FSAR Figures 2.4-17 and 2.4-25.
- Because the staff uses the CCNPP Unit 3 site boundary in its safety determination related to flooding, it is essential that the staff know which of the applicant's depictions of the site boundary is correct.
- The applicant is requested to provide revised figures in FSAR Section 2.4 that include the site boundary and ensure that the boundary is consistently shown in the figures throughout this section.

New RAI 400, Question 02.04-2
Estimate of Bounding Value for Subsidence Resulting from Plant Groundwater Use

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- In the response to RAI 101, Question 02.04.12-3, the COL applicant estimated maximum subsidence from the use of onsite groundwater for construction. This rate of use is estimated to be 288,000 gpd for six years.

- The COL FSAR states that groundwater will be used during plant operation as a back-up supply when the desalination plant is out of service. This rate of use is estimated to be 900 gpm (1,296,000 gpd if pumped continuously) for a period up to 10 weeks.

- Staff want to verify that the estimate of drawdown and subsidence documented in the response to RAI 101 remains bounding given the potential operational use of groundwater identified in the COL FSAR.

New RAI 400, Question 02.04-2
Bounding Value for Subsidence (continued)

The applicant is requested to provide:

- The anticipated frequency at which the desalination plant will be out of service and thus require a back-up water supply.
- The bounding pumping scenario considering that the water source has not been identified by the COL applicant and could be the Aquia, Upper Patapsco, or Lower Patapsco aquifer.
- Evaluation of the effects of the associated long term site surface deformation on foundation stability and flooding protection measures.

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Acronyms

ACRS	Advisory Committee on Reactor Safeguards
CCNPP	Calvert Cliffs Nuclear Power Plant
COL	Combined Operating License
DSEA	Division of Site Safety & Environmental Analysis
FSAR	Final Safety Analysis Report
FSER	Final Safety Evaluation Report
gpd	gallons per day
gpm	gallons per minute
mgd	million gallons per day
PMF	Probable Maximum Flood
PNNL	Pacific Northwest National Laboratory
RAI	Request for Additional Information
RCOL	Reference Combined License
SE	Safety Evaluation
UHS	Ultimate Heat Sink

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Presentation to the ACRS Subcommittee

UniStar Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 COL Application Review

Safety Evaluation Report

CHAPTER 9: Auxiliary Systems

November 6, 2013

Staff Review Team

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- **Project Manager**
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  - Michael Takacs, acting Lead Project Manager
  - Peter Hearn, Chapter 9 Project Manager

Summary of Staff's Review

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SRP Section/Application Section		Number of RAI Questions	Number of SE Open Questions
9.1	Fuel Storage and Handling	2	0
9.2	Water Systems	36	2
9.3	Process Auxiliaries	IBR	0
9.4	Air Conditioning, Heating, Cooling, and Ventilation Systems	8	2
9.5	Other Auxiliary Systems	23	0
Totals		69	4

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List of Open Items
Chapter 9.0 Auxiliary Systems

1. RAI 393 Question 09.02.05-31- Ensure COL information is incorporated into next COL FSAR Revision
2. RAI 398 Question 09.02.05-32 – Clarification related to the CFD computer model uncertainties, meteorological conditions, and boundary scenarios.
3. RAI 382 Question 09.04.04-4 – Detail Design information for the SWBVS
4. RAI 384 Question 09.04.03-1- ITAAC information for power supplies for the 2 diesel driven pump room vent systems

COL Topic of Interest

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Chapter 9.1.4 FUEL STORAGE and HANDLING SYSTEMS COL Information Items

DCD COL item 9.1-2:

"A COL applicant that references the U.S. EPR design certification will perform appropriate tests and analyses, which demonstrate that an identified NRC-approved cask can be safely connected to the spent fuel cask transfer facility (SFCTF), and the cask and its adapter meet the criteria specified in Table 9.1.4-1, prior to initial fuel loading into the reactor."

Chapter 9.1.4 FUEL STORAGE and HANDLING SYSTEMS COL Information Items

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Calvert Response to COL Item:

Before initial fuel loading into the reactor:

- Demonstrates that an identified NRC-approved cask can be safely connected to the SFCTF, by test and analysis.

Before initial use of SFCTF:

The licensee shall not use the SFCTF for initial cask loading operations until the licensee performs the tests identified below,

- Verify the penetration leak tightness with loading pit filled with water.
- Verify the cask loading sequence and the sequential interlocking with the actual cask and a dummy assembly under water.

Spent Fuel Cask Transfer Facility (SFCTF)

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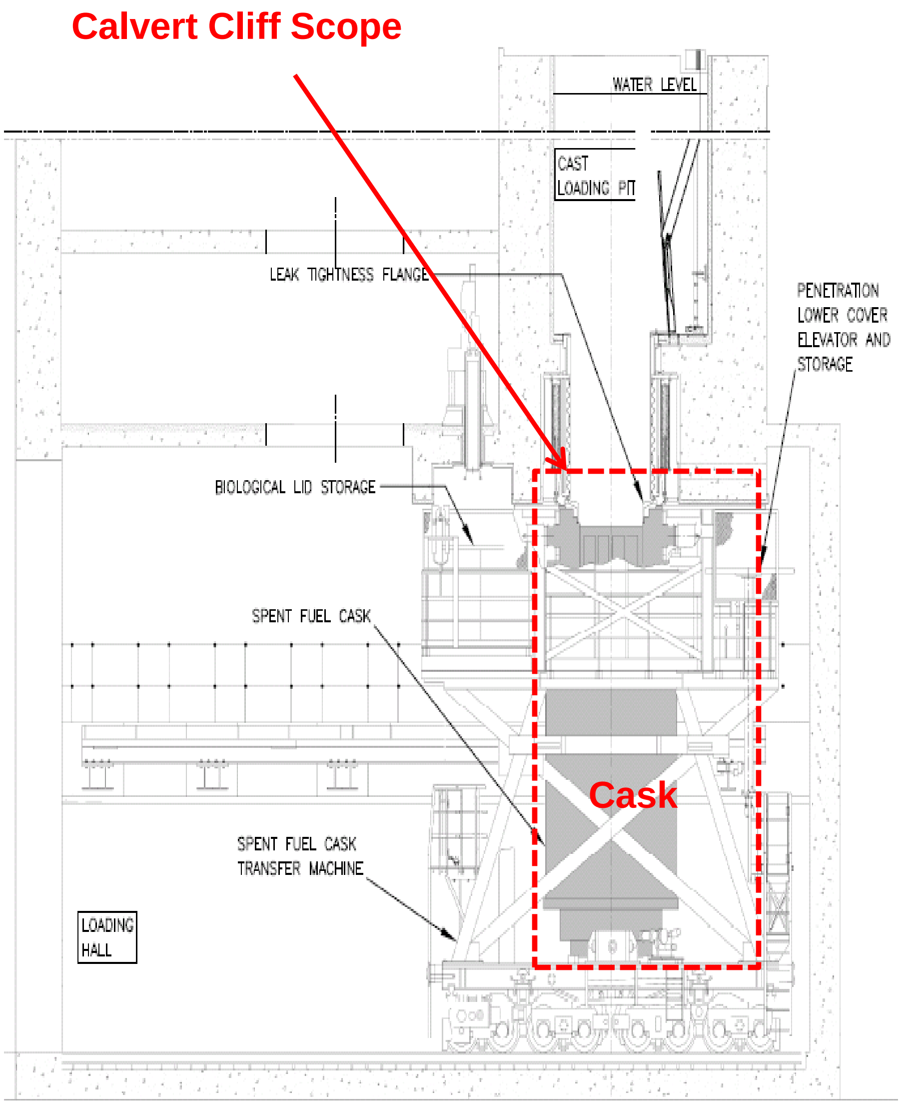
DCD COL item 9.1-2:

"A COL applicant that references the U.S. EPR design certification will perform appropriate tests and analyses, which demonstrate that an identified NRC-approved cask can be safely connected to the spent fuel cask transfer facility (SFCTF), and the cask and its adapter meet the criteria specified in Table 9.1.4-1, prior to initial fuel loading into the reactor."



COLA Topics of Interest
Chapter 9.2– Water Systems

- **Open Items:**
  - RAI 393/7151 Question 09.02.05-31 (ITAAC) – Section 9.2.5
  - RAI 398/7198 Question 09.02.05-32 (analysis uncertainties) – Section 9.2.5

COLA Topics of Interest
Chapter 9.2–Auxiliary Systems

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- **FSAR Section 9.2.1 (Essential Service Water System - ESWS)**
  - **COL Information Item 9.2-4 -** description of materials that will be used for the ESWS
    - All piping will be plain carbon steel
    - Has adequate 60 year design life against corrosion
    - Buried piping
      - Internal lining in accordance with ANSI/AWWA (qualified installation program)
      - External epoxy coatings
      - Cathodic protection (FSAR 8.3.1.1.15)
  - **Staff's Finding** - meets applicable GDCs

COLA Topics of Interest
Chapter 9.2–Water Systems

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- **FSAR Section 9.2.5 (Ultimate Heat Sink - UHS)**
  - **COL Information Item 9.2-1 –** site specific UHS support systems
    - Normal UHS makeup (isolated on safety injection signal)
    - Emergency UHS makeup (post accident plus 72 hours – 30 days)
      - UHS makeup water intake structure
      - 27 days water supply from Chesapeake Bay
      - Four safety related pumps with traveling screen and screen wash
      - Keep fill system (reduces water hammer concerns)
      - Safety-related and Class 1E power to key components
      - Pumps are manually started from the main control room
      - Design considerations against freezing
  - **Staff's Finding -** meets applicable GDCs

COLA Topics of Interest
Chapter 9.2–Water Systems

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- **FSAR Section 9.2.5 (UHS) – continues**
  - **COL Information Item 9.2-5 –** material used for the UHS are appropriate for site location and fluid properties
    - UHS makeup piping material is safety-related and compatible with Chesapeake Bay brackish water
    - Super austenitic stainless steel to be utilized – prevents erosion and corrosion pitting
    - Piping system to be flushed quarterly
- **Staff's Finding -** meets applicable GDCs

COLA Topics of Interest
Chapter 9.2–Water Systems

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- **FSAR Section 9.2.5 (UHS) – continues**
  - **COL Information Item 9.2-6 –** confirm that the highest average site wet bulb and dry bulb temperatures over a 72-hour period (30-year hourly regional climatological data set) that the site specific evaporative and drift losses for the UHS are bounded by the values presented in U.S.EPR Design Certification
    - The U.S. U.S.EPR and CCNPP Unit 3 use the same 72 hour period of temperature data to determine maximum evaporation of water from the UHS
    - Found in COL FSAR Table 9.2.5-3
  - **Staff's Finding -** meets applicable GDCs

COLA Topics of Interest

Chapter 9.2–Water Systems

- **FSAR Section 9.2.5 (UHS) – continues**
  - **COL Information Item 9.2-7** – confirm that the site-characteristic sum of 0% exceedance maximum non-coincident wet bulb temperature and the-site specific wet bulb correction factors does not exceed the 81 °F (U.S. EPR value in U.S.EPR Table 9.2.5-2); OTHERWISE, confirm that the UHS cold water return temperature is less than 95 °F
    - CCNPP Unit 3 site-specific 0% exceedance maximum non-coincident wet bulb temperature is determined to be 85.3 °F (based on data from Patuxent River Naval Air Station)
    - To determine the wet bulb correction factor for cooling tower recirculation and interference, a computational fluid dynamics (CFD) analysis of the UHS cooling towers was completed using the software CD-adapco Star-CCM+
    - The maximum site-specific wet bulb correction factor due to UHS cooling tower interference and recirculation was determined by analysis to be < 2.5 °F
    - Max. 0% exceedance non-coincident wet bulb with correction factor is 87.8 °F
    - Based on the UHS cooling tower analysis the maximum cold water return temperature was determined to be <95 °F (includes cooling tower recirculation and interference analysis)

COL Information Item 9.2-7 - continues

Staff's Finding - (open item)

RAI 398/7198 Question 09.02.05-32 – CFD model uncertainties, meteorological conditions, and bounding scenarios

NRC audit of CFD on October 1-2, 2013, determined that wind directions and wind speed selected may not be bounding

COLA Topics of Interest

Chapter 9.2–Water Systems

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- **FSAR Section 9.2.5 (UHS) – continues**
  - **COL Information Item 9.2-8 –** UHS makeup capacity is sufficient to meet the maximum evaporative and drift water loss after 72 hours – 30 days (consistent with RG 1.27)
    - U.S.EPR FSAR Table 9.2.5-2, Ultimate Heat Sink Design Parameters, states the required cooling tower emergency makeup flow, post DBA (72 hours through 30 days) as > 300 gpm
    - Unit 3 UHS Makeup Water pumps are sized to provide a maximum of approximately 750 gpm to the UHS Cooling Tower basin
    - When the intermittent traveling screen wash system is operating the makeup flow rate to the basin is reduced to approximately 510 gpm
  - **Staff's Finding -** meets applicable GDCs

COL Topics of Interest Chapter 9.2–Water Systems

U.S.NRC
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- **FSAR Section 9.2.5 (UHS) – continues**

  - **COL Information Item 9.2-9** – confirm that the U.S.EPR UHS cooling towers are capable of removing the design basis heat load for a minimum of 30 days without exceeding the maximum specified temperature limit for ESWS and minimum required basin water level cooling tower basin is chemically treated to reduce scaling and corrosion, and to treat potential biological contaminants

COL Topics of Interest
Chapter 9.2–Water Systems

U.S.NRC
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- **COL Information Item 9.2-9- continues**
  - Cooling tower is designed for an initial Total Dissolved Solids (TDS) value of 5,000 ppm
  - TDS concentration of the cooling water in the basin may reach up to 72,460 ppm
  - Thermal performance of the cooling tower was performed by the prospective cooling tower vendor
  - Was determined that the cooling tower basin water temperature remains below 95 °F for the 30-day period post-DBA
  - The impact of the reduced cooling tower thermal performance due to the concentrated TDS levels will be off-set by the reduced heat load on the cooling tower

Staff's Finding - (open item)

RAI 393/7151 Question 09.02.05-31 (ITAAC)

COLA Topics of Interest
Chapter 9.2–Water Systems

U.S.NRC
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- **FSAR Section 9.2.5 (UHS) – continues**
  - **COL Information Item 9.2-10 –** perform an evaluation of the interference effects of the UHS cooling tower on nearby safety related air intakes
    - Four safety related air intakes have been evaluated for potential adverse effects from the UHS cooling tower plumes:
      - Main Control Room (MCR) Air Conditioning System
      - Safeguards Building Ventilation
      - Emergency Power Generating Ventilation and Combustion Air
      - Essential Service Water Pump Building (ESWPB) Ventilation
    - CFD simulations was performed at various wind speeds and wind directions
    - Adequate temperature margin for MCR and Safeguards ventilation ~13 °F
    - No adverse affects on the Emergency Power Generating Ventilation, ESWPB Ventilation, or Emergency Diesel Generator combustion air intake
- **Staff's Finding - (open item)**
  - RAI 398/7198 Question 09.02.05-32 – CFD model uncertainties, metrological conditions, and bounding scenarios

COLA Topics of Interest
Chapter 9.2–Water Systems

U.S.NRC
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- **FSAR Section 9.2.5 (UHS) – continues**
  - **COL Information Item 9.2-11 –** confirm that the maximum UHS cold-water return temperature of 95 °F is met by an analysis (site specific wet bulb and dry bulb temperatures over a 24-hour period, from a 30-year hourly regional climatological data set) is bounded (peak 85.3 °F at DBA plus 9-10 hours)
    - The COL applicant has verified that with the peak heat loads and peak wet bulb temperatures, the ESWS cold water return temperature does not exceed the cooling tower basin design of 95 °F
    - Wet bulb of 85.3 °F occurs at DBA plus 3-4 hours
    - U.S.EPR FSAR Tier 1, Revision 4, Table 2.7.11-3, Item 7.9 ITAAC Acceptance Criteria states that a report concludes that the UHS cooling towers are capable of removing the design heat load without exceeding the maximum design temperature limit for ESWS
  - **Staff's Finding -** meets applicable GDCs

COLA Topics of Interest
Section 9.2–Water Systems

- **FSAR Section 9.2.9 Raw Water Supply**
- **COL Information Item 9.2-3 and conceptual information –** The raw water supply system (RWSS) and the design requirements of the RWSS are site-specific and will be addressed by the COL applicant
  - Draws from the Chesapeake Bay via circulating water system makeup system to the desalinization plant
  - Untreated water for makeup to the demineralized water, potable water, fire protection, and UHS normal makeup
  - Non-safety-related functions
  - Two desalinated water transfer pumps at 790 gpm each
  - ESWS basin max flow rate is ~1500 gpm (max. plant shutdown/cooldown)
  - Two 300,000 gallon tanks store desalinated water
  - Corrosion resistant materials
- **Staff' Finding -** meets applicable GDCs

COLA Topics of Interest

Section 9.4 - Air Conditioning, Heating, Cooling, and Ventilation Systems

- **Section 9.4 Total Subsections: 16**
- **Subsections with IBR Design: 13**
- **Subsections with Site-Specific Design: 3**
- **Number of SE open items: 2**

  - RAI 382 Question 09.04.04-4 (FSAR Section 9.4.4): Detailed design information for the SWBVS (turbine Island). Applicant's response to this RAI question has been reviewed and is found acceptable. The designation of this item will be changed a confirmatory item.

  - RAI 384 Question 09.04.03-1 (FSAR Section 9.4.16): ITAAC information for power supplies for the 2 diesel driven water pump room ventilation systems. Applicant's response to this RAI question has been reviewed and is found acceptable. The designation of this item will be changed a confirmatory item.

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Comments or questions?

Acronyms

U.S.NRC
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- ANSI – American National Standards Institute
- AWWA – American Water Works Association
- CFD – computational fluid dynamics
- COL - combined license
- DBA – design basis accident
- ESWS - Essential service water system
- GDC – General Design Criteria
- FSAR - Final Safety Analysis Report
- GL - Generic Letter
- ITAAC - Inspections, tests, analyses, and acceptance criteria
- RAI - request for additional information
- RG - Regulatory Guide
- RWSS – raw water supply system
- TDS - total dissolved solids
- UHS – Ultimate Heat Sink
- U.S. EPR – Evolutionary Power Reactor