UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

February 15, 2013

MEMORANDUM TO: ACRS Members

FROM: Kathy D. Weaver, Senior Staff Engineer /RA/
Reactor Safety Branch A, ACRS

SUBJECT: CERTIFICATION OF THE MINUTES FOR THE U.S. EPR SUBCOMMITTEE MEETING ON JANUARY 17, 2013, ROCKVILLE, MARYLAND

The minutes of the subject meeting were certified on February 7, 2013, as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc w/o Attachment: E. Hackett
C. Santos

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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WASHINGTON, DC 20555 - 0001

February 15, 2013

MEMORANDUM TO: Kathy D. Weaver, Senior Staff Engineer
Reactor Safety Branch A, ACRS

FROM: Dr. Dana Powers, Chairman
U.S. EPR Subcommittee

SUBJECT: CERTIFICATION OF MINUTES FOR THE ACRS U.S. EPR SUBCOMMITTEE MEETING ON JANUARY 17, 2013, ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on January 17, 2013, are an accurate record of the proceedings for that meeting.

/RA/ 2/7/2013

Dr. Dana Powers, Date
U.S. EPR Subcommittee Chairman

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF THE ACRS US-EPR SUBCOMMITTEE MEETING
JANUARY 17, 2013

The ACRS US EPR Subcommittee held a meeting on January 17, 2013 in Room T-2B3, 11545 Rockville Pike, Rockville, Maryland. The meeting convened at 8:30 a.m. and adjourned at 2:35 p.m. The entire meeting was opened to the public.

ATTENDEES/PRESENTERS

ACRS Members/ Staff
Dana Power, Chairman
John Stetkar, Member
Gordon Skillman, Member
Steve Schultz, Member
Mike Ryan, Member
Kathy Weaver, ACRS Staff, DFO

NRC Staff
Surinder Arora
Joe Colaccino
Samantha Crane
Dave Jaffe
Edmund Kleeh
Yiu Law
Michael Miernicki
Sunwoo Park
Brian Thomas

Other Attendees
Antonio Fernandes, UniStar
Mark Finley, UniStar
Charles Hofmayer, Brookhaven National Laboratory (via telephone)
Mark Hunter, UniStar
Todd Oswald, AREVA
Shankar Rao, Bechtel
John Tynan, UniStar
Xing Wei. Brookhaven National Laboratory
Russell Wells, AREVA

SUMMARY

The purpose of the meeting was to hear presentations and discuss the information contained in Chapter 3, "*Design of Structures, Components, Equipment, and Systems*," except for Section 3.7, "*Seismic Design*," and Chapter 14, "*Verification Programs*," of the Safety Evaluation Report

(SER) with Open Items related to the review of the Calvert Cliffs Unit 3 Combined Operating License Application (COLA) FSAR, which references the U.S. EPR DCD.

There was a presentation on the FSAR Chapters from UniStar the Calvert Cliffs Unit 3 COLA applicant, followed by presentations from the staff of the Office of New Reactors (NRO) who performed the review and prepared the associated sections of the SER Chapters with Open Items. The meeting transcripts are attached and contain an accurate description of each matter discussed during the meeting. The presentation slides and handouts used during the meeting are attached to these transcripts.

The following table lists the significant issues that were discussed during the meeting with the corresponding pages in the transcript.

SIGNIFICANT ISSUES	
Issue	Reference Pages in Transcript
UniStar presentation on Chapter 3 - Design of Structures, Components, Equipment, and Systems	10-87
Member Stetkar questioned that given the monthly testing the applicant has assumed on the turbine stop and control valves and the low-pressure intercept valves, he did not know how they calculated their failure rate per demand for those valves. Member Stetkar commented that he had come up with a value that's about 20 times higher than the applicant. The applicant commented that they would provide Member Stetkar more information during future discussions.	35
Member Stetkar further questioned that the applicant also did not account for any common cause failures of anything, of the Turbine valves in particular. Member Stetkar commented that they did not account for what's called a state of knowledge correlation, and they did not do any uncertainty analyses. The applicant commented that they would also provide further information to address his comments and questions.	36
Member Stetkar also asked the applicant had anyone present who could comment on information in the document that states that the basis of the applicants conclusions is on a monthly test of the valves (the stop and control valves, and intercept valves.) Member Stetkar questioned the specifics of this test (i.e. a daily test of, an end test of the electronic overspeed trip mechanism out through the energizing the solenoid valves in the trip locks.) The applicant stated that they will also provide further details of the test during future discussions. Member Schultz also stated that “In addition to the evaluation assumptions, the rationale associated with those assumptions would be what the subcommittee would want to see.”	38-41

The members had questions regarding the buried electrical duct banks and requested a picture of that duct bank to better understand its configuration. The applicant provided a diagram and the members were satisfied with the applicant's response.	52-53
The applicant stated that they will basically install a waterproofing system that will protect any portions of the powerblock structures that are below that water table level. The applicant further stated that it will be essentially an impermeable boundary that prevents the water table from intruding toward the concrete of the safety structures. Member Ryan asked how are these areas going to be protected from infiltration and surface water? Member Ryan commented that they have structures in an unsaturated zone and a saturated zone and what the applicant explained was the saturated zone interaction. Member Ryan wanted to know about the unsaturated zone interaction as well? The applicant responded that two or three feet away from the concrete structure they plan to have an impermeable barrier, or waterproof barrier, and monitoring wells within that two or three feet, which will demonstrate that the area stays dry. The applicant also commented that they will also have the capability to dewater if necessary. Member Ryan asked "What's the typical infiltration in terms of inches per year in this area?" The applicant responded that they would provide Member Ryan more information during future discussions.	63-64
NRC staff presentation on Chapter 3	87-125
Members discussed RAI 376 regarding the Alstom Document which included the turbine valve control and overspeed protection systems. Member Stetkar restated that the applicant has a take away item for this discussion.	93-94
There was much discussion regarding strategies to mitigate the attack of corrosion from ground water on structures. Chairman Powers commented that the applicant has three strategies to try to mitigate the attack, which includes engineered backfill, an impermeable membrane, and superior concrete. Chairman Powers commented that none of these barriers carry with them a guarantee that they will stop, absolutely, the attack by the water on the concrete. Member Powers stated that the barriers will slow the attack down a bit, but he wants to understand if all these things fail, how badly is the concrete and reinforcements then going to be attacked? Chairman Powers questioned how fast or what is the rate of a protection? The staff responded that the long-term performance of a geo membrane waterproofing system is a key to protection of the NI basemat. The staff stated that the 40 to 60 years of a lifespan, and the long-term durability issue was pointed out earlier, and that they will review the issue including the long-term performance, and the durability issue of a geo membrane.	118-121
UniStar presentation on Chapter 14 – Verification Programs	125-157
NRC staff presentation on Chapter 14	157-180

DOCUMENTS PROVIDED TO THE SUBCOMMITTEE

The following documents were provided to the members prior to the meeting:

- Calvert Cliffs Nuclear Power Plant Unit 3 Combined License Application, Final Safety Analysis Report, Chapter 3, "*Design of Structures, Components, Equipment, and Systems,*" Revision 7, dated December 20, 2010.

- Calvert Cliffs Nuclear Power Plant Unit 3 Combined License Application – Safety Evaluation Report with Open Items for Chapter 3, "*Design of Structures, Components, Equipment, and Systems."*

- Calvert Cliffs Nuclear Power Plant Unit 3 Combined License Application, Final Safety Analysis Report, Chapter 14, "*Verification Programs*," Revision 7, dated December 20, 2010.

Calvert Cliffs Nuclear Power Plant Unit 3 Combined License Application – Safety Evaluation Report with Open Items for Chapter 14,

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
US EPR Subcommittee

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Thursday, January 17, 2013

Work Order No.: NRC-3038 Pages 1-180

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

U.S. EPR SUBCOMMITTEE

+ + + + +

THURSDAY

JANUARY 17, 2013

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dana A. Powers, Chairman, presiding.

COMMITTEE MEMBERS:

DANA A. POWERS, Chairman

MICHAEL T. RYAN, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

NRC STAFF PRESENT:

KATHY D. WEAVER, Designated Federal Official
SURINDER ARORA
JOE COLACCINO
SAMANTHA CRANE
DAVE JAFFE
EDMUND KLEEH
YIU LAW
MICHAEL MIERNICKI
SUNWOO PARK
BRIAN THOMAS

ALSO PRESENT:

ANTONIO FERNANDEZ
MARK FINLEY
CHARLES HOFMAYER (via telephone)
MARK HUNTER
TODD OSWALD
SHANKAR RAO
JOHN TYNAN
XING WEI
RUSSELL WELLS

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

(8:29 a.m.)

CHAIR POWERS: The meeting will now come to order. This is a meeting on the Advisory Committee of Reactor Safeguards U.S. EPR Subcommittee. I'm Dana Powers, chairman of the Subcommittee. The ever-lovely Kathy Weaver is our designated federal official, and she runs a tight ship.

ACRS Members in attendance are Steve Schultz, John Stetkar, Michael Ryan, Dick Skillman, and they are exacting and demanding individuals, yes.

The purpose of this meeting is to continue our review of the Safety Evaluation Report with Open Items for the Combined License Application submitted by UniStar Energy for the Calvert Cliffs Nuclear Power Plant Unit 3.

And we will hear presentations and discuss Chapter 3, Design of Structures, Components, Equipment, and Systems; and Chapter 14, Verification Programs. The Subcommittee will hear presentations by and hold discussions with representatives of UniStar, the NRC staff and other interested parties.

As you are aware, subcommittees gather information for presentation to a future full committee meeting, and we have not decided on when that future

full committee will be for this particular work.

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 bridgeline established in the meeting room for members of the public, which is set for a listen-in-only mode. 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 that participants in this meeting use the microphones located throughout the meeting room when addressing the Subcommittee. The participants should first identify themselves and speak with sufficient clarity and volume so they can be readily heard.

I understand that after the break during NRC's staff presentation on Chapter 3, Mr. Charles Hofmayer, an NRC contractor from Brookhaven National Laboratory plans to participate in these discussions from a telephone line that we will establish. Charles apparently doesn't like our company and camaraderie?

MR. ARORA: He had some other engagements to take care of, conflicting.

CHAIR POWERS: I suspect the membership

will have to work on their behavior and comportment. We've apparently offended Charles.

Copies of the meeting agenda and handout are available in the back of the room. Do any of the members have any opening comments they are prepared to make? I see none, so I'm going to turn the meeting over to Surinder Arora, the NRC project manager, to give us some opening comments. Sur?

MR. ARORA: Thank you, Mr. Chairman. Good morning. My name is Surinder Arora and I'm the lead PM for Calvert Cliffs Unit 3 COL Reviews for NRC.

Today we are here to present two chapters, Chapter 3, except Section 3.7; and Chapter 14, which is scheduled for the afternoon. The order of today's presentation would be as on this slide. I will provide a brief overview of the project status, and then UniStar will make their presentation which will then be followed by the staff's presentation. The staff presentation will be facilitated by Mike Miernicki who is sitting on my left here. He is the PM for Chapter 3.

As the title depicts, this slide provides in chronological order the submittals on the COL application sent to NRC. We are currently at Revision 8, that's the current revision. However, Chapter 3 that we are presenting today to the Subcommittee is based

on up to Revision 7.

The last row here lists all the chapters which have been through ACRS reviews, and these chapters are currently in Phase 4. I'll be defining the phases on the next slide here.

This slide provides what these review phases are. Calvert's application is being reviewed under a six-phase schedule, and we are currently in Phase 2 and 4, Phase 3 being the Advisory Committee review.

The chapters which have already been through Advisory Committee reviews are in Phase 4, and the rest of the chapters are still in Phase 2. And the right-hand column which is titled Target Dates, most of them are shown TBD because we are reevaluating the schedules and these dates will be published as we issue the schedule later to the Applicant.

Next slide lists the chapters which are remaining to be going through Phase 2 reviews. The first one, Chapter 2, only two sections are remaining. 2.4: Hydrologic Engineering, and 2.5: Geology, Seismology and Geotechnical Engineering.

CHAIR POWERS: Yes, those nontrivial sections.

MR. ARORA: Yes.

(Crosstalk)

MR. ARORA: The other chapters remaining are 9 and 13, and the dates, issue dates for those two are being evaluated at this time.

CHAIR POWERS: Okay, but you think, or is that sometime around --

MR. ARORA: Yes. I just want to make a brief comment before I turn it over to Mark Finley to start the UniStar presentation. I just have a generic comment on our review process.

Several chapters of COLA FSAR incorporate by reference the U.S. EPR Design Certification Application, and as we know that application is concurrently being reviewed as we are doing reviews on the COLA application, COL application.

The staff in their reviews made sure that the information that's incorporated by reference together with the information that's presented in the COL FSAR represents the complete section. That's what our review process requires.

And to track the changes to the design we have created a generic open RAI, and that RAI will not be closed until we have a final revision from AREVA on the DC, and we have done the reconciliation on our SERs based on that final revision. But then we'll close that RAI. That's how we are tracking the changes to the

design.

With that --

MEMBER SKILLMAN: Surinder, on that topic, how many items are in that RAI right now?

MR. ARORA: That are?

MEMBER SKILLMAN: How many items are in that RAI? You just said --

MR. ARORA: It applies to all the chapters.

MEMBER SKILLMAN: I understand that. How many items are in there? Ten, 50, 100, 500?

MR. ARORA: That's hard to say because they keep changing because new COL items are introduced whenever the revisions are submitted on the applications.

MEMBER SKILLMAN: Can you give us an approximate number?

MR. ARORA: At this time I would say we may be close to about 60, 70 items.

MEMBER SKILLMAN: Thank you.

MR. ARORA: But number keeps changing.

MEMBER SKILLMAN: I can understand that. Thank you.

MR. ARORA: And if there are no further questions I would like to turn over the meeting to Mr. Finley to start UniStar's presentation, and he will

introduce his team and get started onto his presentation.

CHAIR POWERS: Are there any more questions, Sur, Mr. Arora? No? Then we will welcome Mark back.

MR. ARORA: Thank you.

CHAIR POWERS: It's been awhile, Mark. Happy New Year.

MR. FINLEY: It has been awhile. Happy New Year, Doctor.

CHAIR POWERS: I was beginning to think you didn't like us.

(Off the record discussion)

MR. FINLEY: Good morning. As Surinder mentioned, my name is Mark Finley. I'm the senior vice president of Regulatory Affairs and Engineering for UniStar. Appreciate the opportunity to be with you this morning. As Dr. Powers said it's been a little while.

So Chapters 3 and 14 are two of the remaining five chapters we have in the Phase 2 and Phase 3 portion of our review, so we'll do those today. And then we have Chapters 13 and 9 and those two sections that Surinder mentioned for Chapter 2 to follow, and we look forward to doing that later in 2013 and to progress on through Phase 2 and Phase 3 this year.

You will notice that Section 3 --

CHAIR POWERS: Based on our scheduling we thought we would be done with this phase by July, right?

MS. WEAVER: Tentatively we were going to have the Subcommittee meetings completing Phase 2 in May.

CHAIR POWERS: May.

MS. WEAVER: And then we would provide at your request a letter and future meetings.

CHAIR POWERS: Okay, so we're not too far from that schedule right now.

MR. FINLEY: Excellent. Excellent. I will also note that as I think you know, Section 3.7 will not be discussed today as the seismic analysis of the structures, primarily for two reasons.

One that in the Design Certification that Section 3.7 is still in progress so we're following the Design Certification, and also we have recently incorporated in Section 2.5, the new seismic input required by the central eastern U.S. report, and as required by Fukushima Recommendation 2.1. So that work is still in progress and the 3.7 review will be conducted under Phase 4 and Phase 5.

The Slide 2, following similar presentations we'll keep the presentation simple and

try to focus on what's important from a site-specific basis. As you know, the Calvert Cliffs Unit 3 FSAR incorporates by reference much of the Design Certification, so we use that methodology.

If we don't cover an area that you're interested in by all means stop us and ask questions. Supported by an able staff here, if I can't your question we'll get you the answer. Chapter 3 for the Design Certification was addressed in front of this committee February 21st of 2012.

And Slide 3, there is one departure and an associated exemption that we'll discuss in this presentation that has to do with the maximum differential settlement allowed for safety structures. We do have no ASLB contentions and there are 76 COL information items related to these sections we'll talk about today.

In terms of introductions, so again I'm Mark Finley. I've been with UniStar for six years now and before that with Constellation, various jobs in Constellation. Before that nuclear Navy, mainly engineering positions. I do have a professional engineer's license from the State of Maryland.

And with me today we have Antonio Fernandez. He's a UniStar consultant in the civil structure area.

He's sitting up front with me here. And we also have representatives from the important vendors that did work for us in Chapter 3. That's Onur Tastan from Rizzo. They're responsible for the makeup water intake structure design.

Shankar Rao from Bechtel, all of the mechanical and electrical site-specific system design. Todd Oswald, who I'm sure you know from Design Certification reviews, responsible for the generic structures design, and Russ Wells from AREVA, licensing manager from AREVA, in case we need that help. And again we'll focus on site-specific information that supplements the Design Certification.

MEMBER SKILLMAN: Mark, before you proceed, back to Slide 3 please. I see you identified one departure and one exemption. We have other information that suggests that there are three departures. One is the water level. One is the coefficient of friction for the sliding stability evaluation. And one is an issue about the basemat.

So my question is not so much for challenge but for clarity. Is there just one departure or are there three?

MR. FINLEY: So let me speak to two of those first and then the third, second. So with respect to

the differential settlement, that's the departure that we'll talk about today. That's the one I identify here.

We did have previously a departure that related to coefficient of friction. Recently in a submittal in the fall time frame we requested removal of that departure, and we'll talk about some of the basis for that. But that letter having been submitted is the basis for our presentation today, i.e., that we no longer need that departure for the coefficient of friction.

MEMBER SKILLMAN: Okay.

MR. FINLEY: Now with respect to water level I'm not familiar, although that might be a different chapter than Chapter 3. Do you have any details?

MEMBER SKILLMAN: Section 3.4.2.4, Departure from U.S. EPR Design Limits in Groundwater Table Elevation.

MR. FINLEY: Okay. I was unaware that that was a departure but I can speak to that.

MEMBER SKILLMAN: Again this is not a challenge to you specifically, it's to make sure I'm on board with what you're presenting in terms of accountability.

MR. FINLEY: I understand. And when we get to the -- well, any of these sections if you have

additional questions. I will speak to the groundwater issue. I was not aware that that was a departure, but we'll follow up on that before the end of today.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay?

MEMBER SKILLMAN: Thanks.

MR. WELLS: Mark, this is Russ Wells from AREVA. That --

(Crosstalk)

MR. WELLS: I just wanted to let you know that departure in 3.4.2 is not in currently Revision 8 of the COL FSAR. I think that might have been taken out in Rev 7, but it's not currently in your Rev 8. I just wanted to point that out.

MR. FINLEY: Okay, thank you.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay. Okay, I think we're on Slide 5. And Slide 5 just lists the different sections of Chapter 3. And again, Section 3.7 will not be discussed today. We're deferring that to Phase 4.

So we start first with Section 3.1 and move quickly to Slide 7. In the first COL item we'll discuss relates to having a site-specific QA Program Plan that demonstrates compliance with GDC 1. And in fact, Calvert Cliffs project does have a quality assurance

program description that has been submitted to and reviewed and accepted by NRC, which demonstrates compliance with GDC 1.

With respect to Criterion 5 - Sharing of Structures, Systems and Components, for information there are these four systems, structure and components that are shared between Calvert Cliffs Unit 3 and the existing Units 1 and 2. That would be the off-site transmission system. We discuss that in Chapter 8.

The existing Chesepeake Bay intake channel and embayment, and I'll say a couple words more about that on the next slide. The meteorological tower which we talked about in the Chapter 2 review, we share the information and data from the met tower at the existing units. And our intention is to share the Emergency Operations Facility with the existing units as well, and that will be discussed during the Chapter 13 reviews next month.

But all these structures, systems and components are designed such that an accident on one unit would not impair the ability to perform, to function on any other unit.

Slide 8. Just to give you a feeling for the site layout and to show you this, how we share the intake structure for the existing units. So at the

bottom center of this slide we see the existing Units 1 and 2.

Those are once-through cooling type plants so they take a large flow from the Chesapeake Bay, and there is an intake structure that's been built with a baffle wall that you see out into the Bay. We are modifying a section of that baffle wall.

You can see sort of the upper right-hand corner of that baffle section of the intake. That's where the makeup water supply to Calvert Cliff Unit 3 will be provided, from that section of the intake structure through underground piping to the makeup water structure that you see. That's essentially how we share the intake.

Again, we've confirmed that there is no effect of the existing units on Calvert 3, and there would also be no effect of Calvert 3 on the existing units. The flow rate taken obviously by Calvert 3 would be much less than the flow rate taken from the Bay for the Units 1 and 2. They're again, they're a once-through plant where makeup for cooling towers.

Questions on existing units and shared structures? Okay. We'll move quickly then to Section 3.2 which is the Classifications of Structures, Systems and Components.

And on Slide 10, in our application we have provided a table that you see here, 3.2.2-1, which provides the seismic classification of the site-specific components that are not classified in the Design Certification. Again we provide that table.

We do have site-specific components that are classified. Our classifications are consistent with the Design Certification. However, we do have two RAI responses open, well, that have been provided that are not yet incorporated in the Revision 8 table, Classification Table RAI 253 and 330.

253 relates to fire protection, and 330 relates to UHS makeup and traveling screens and screen wash systems. There were some upgrades to the classification of traveling screen and screen wash that are not yet incorporated in Revision 8.

MEMBER SKILLMAN: I do have a question on this section. You're using a category, Seismic Category II, SSCs. It appears as though you've targeted this classification for fire protection, predominantly fire protection.

My question goes over to Calvert 1 and 2. Are they classified the same way, or are the Calvert 1 and 2 fire systems not seismic?

MR. FINLEY: So let me first say that that

RAI 253 response that I mentioned to you that's not yet incorporated in Revision 8 or Revision 7 relates to this Category II SSC classification for fire protection.

Category 2 SSC is essentially there to represent that the fire protection system needs to be seismically qualified to perform a function after a safe shutdown earthquake at the site. We're not really changing the basic premise of that classification although we are changing the specific words we choose to describe it. So that's still ongoing.

With respect to Calvert 1 and 2, I can tell you at least while I was there the fire protection system was not seismically qualified. That plant went into service prior to Reg Guide 1.189 requirements.

MEMBER SKILLMAN: That was a curiosity question. I just wanted to clear that one from my mind.

MR. FINLEY: Yes, thank you.

MEMBER SKILLMAN: Okay. Got it.

MR. FINLEY: Okay, that was it for 3.2. Moving on to Section 3.3 which is Wind and Tornado Loadings. And on Slide 12, so I'll group my comments in terms of generic and site-specific structures. So we have generic structures which really are all the powerblock structures that are located at an 85-foot

elevation at the site, and we'll talk more about that.

Site-specific structure, we have one primary site-specific structure which is the makeup water intake structure, which is the structure you saw down on the Chesapeake Bay, close to the water level at the Chesapeake Bay.

So with respect to the generic structures on the powerblock, we intend to use the generic design as described in the Design Certification, and we also apply the loads that are applied in the Design Certification with respect to wind and tornado.

The Calvert Cliffs site is bounded by the wind and tornado assumptions made in the Design Certification. I think I have a slide later that talks about that Calvert Cliffs is actually in Region II with respect to Reg Guide 1.76, and the strength of the tornado maximum winds is bounded by that assumed in the Design Certification, and the same for the maximum wind.

So therefore, using the generic structures at the Calvert Cliffs site is conservative in that regard because our winds should not be as challenging.

With respect to the site-specific structures, as I said, the main structure here affected by wind and tornadoes is the makeup water intake structure. And there we continue to use the generic assumption for

tornado and wind speed velocities. So it's conservative for the site.

MEMBER SKILLMAN: Before you change, there is an iconic image that industry is seeing of your F4 tornado whizzing by Calvert 1 and 2. For your design for Calvert 3 are you able to withstand what that front and passage delta P versus time is?

MR. FINLEY: Yes, that's correct. I'm not familiar with all the specifics of the tornado that actually occurred, but it is bounded by the Reg Guide classification which is a 200-mile-an-hour wind speed tornado. It would bound that which actually occurred, yes.

MEMBER SKILLMAN: Thank you. Okay, thanks.

MR. FINLEY: Slide 13. With respect to evaluation of non-safety structures, we do use site-specific wind load assumptions, okay. Remember I said, with respect to safety structures we use the assumptions in the Design Certification?

With respect to non-safety structures we actually use site-specific wind assumptions related to tornadoes and hurricane winds, et cetera, but again in accordance with appropriate codes and standards and guidance.

Slide 14. We did some specific work to address potential failure of non-safety structures and how that might impact safety structures under tornado loads, and we looked primarily at non-safety structures that were close enough in proximity to the safety structures to potentially cause some damage.

And of note is we do have some panels on our turbine slant switchgear building which are designed to blow off. It's actually part of the structural design of the building so the structure itself does not collapse and have some effect on safety structures. But the paneling could blow off, so we made sure that any missiles created by that siding would be bounded by the missile assumptions that we make in the safety structures. So we confirm there is no effect on safety structures.

And of course we looked also at our circulating water, makeup water intake structure, which is adjacent to the UHS makeup water intake structure, and assure that its design for tornado loading is such that a tornado would not cause that structure to affect the safety structure. That's essentially what I have there.

Move on to Section 3.4, and here we talk about Water Level or Flooding Design. I move to Slide

16. So we need to again think of the site in two sections.

As I mentioned, we have the generic structures up on the plant grade at about 85-foot elevation with zero-foot essentially meaning sea level of the Chesapeake Bay, so 85-foot is well above any potential influence from the Chesapeake Bay.

So mainly what we look at on the plant grade is precipitation, and we make sure we have a drainage structure set up to handle a maximum precipitation assumption which you've actually already reviewed. And we confirm that we're below the maximum flood elevation that's required in the Design Certification, and that is one foot below the grade for these powerblock structures. And we, in fact, are about three foot below the grade in terms of any precipitation, worst case flooding due to precipitation, okay.

Now with respect to the UHS makeup water intake structure, again that's located on the Chesapeake Bay, so we've done a lot of work to study the worst case surge and wave runup caused by a hurricane that might move up just west of the Bay. Some very conservative assumptions taken with respect to that.

We calculate a maximum wave runup which is on top of a surge created by the hurricane of about 33.2

feet, and that's about three feet below where the intakes are for the ventilation on the structure on the Bay.

So we think we have some margin and we were very conservative in the calculation and at least to date with respect to addressing Near-Term Task Force Recommendation 2.1 to evaluate flooding using the current standard with respect to flooding and hurricane, maximum hurricane flooding, this is acceptable with respect to the Fukushima Recommendation.

CHAIR POWERS: You've been very careful as a current testing, but I've been thinking about, your best guess, any of that stuff going to change on you?

MR. FINLEY: Dr. Powers, you're probably in a better position than I am to --

CHAIR POWERS: I told you I'm not.

MR. FINLEY: I don't believe so. With respect to flooding and what I've just talked about in terms of hurricanes, I'm not aware of any initiatives either within NRC or internally that would change any of this data that you see here.

CHAIR POWERS: Just a frustration that you just don't know how conservative you have to be in this area.

MR. FINLEY: Right. Just to give you my synopsis of the hurricane that we chose. So it's

Category 5 hurricane and it hits the shore moving east to west, basically perpendicular to the shore at the worst possible point for introducing a surge on the Chesapeake Bay, number one.

Number two, the storm moves ashore and then turns north right along the west shore of the Bay so that the winds are blowing up the Bay. So I can't conceive, frankly, of a worse scenario. So that's what produces this 32.2-foot wave runup.

And by the way, when we say wave runup that's not, you know, green water. That's not blue water, that's also in the sort of heavy splashing that's part of that calculation. So I think we have significant margin in this structure.

MEMBER RYAN: So rather than try and deal with some sort of uncertainty analysis, you really did what sounds like a bounding kind of case from the hurricane itself.

MR. FINLEY: That's correct.

MEMBER RYAN: Have you done any, and maybe you just scored this at the maximum event that could happen?

MR. FINLEY: We believe it's the maximum event that could happen. Now certainly in terms of the strength of the hurricane, I think that it's Category

5 as I mentioned, the winds are probably not as strong as that which you assume for a site in Florida, but we just don't believe that that's possible in the location where the site is at in the state of Maryland. So I think this is, anything beyond this would be incredible in my view.

MEMBER RYAN: Fair enough.

MR. FINLEY: There is also some, and Onur from Rizzo might help, I think there is some uncertainty built into the analysis of the surge on the Bay. I think a 20 percent uncertainty number is included there. But it is basically a deterministic type analysis with certain assumptions for the storm.

MEMBER RYAN: At the end of the day with the conservatisms built in you have a three-foot margin.

MR. FINLEY: That's correct.

MEMBER RYAN: And I guess I'm trying to just get a sense, is that a significant margin or is that kind of close to the edge?

MR. FINLEY: Well, I believe it's a significant margin given that in addition to the height difference we do have a splash protection on the ventilation intakes for the structure that should prevent any major water insertion.

And I should also mention that this

structure, as I think you know, this structure is only needed 72 hours after the design basis event, okay. So we have basins that contain the water that we need for the first 72 hours of the worst case scenario. We have water basins under each of the UHS cooling towers. This makeup is only needed just prior to the 72-hour time frame expiring. So I'm not saying that to say I'm concerned about the margin, but only from a safety standpoint there is some time.

MEMBER RYAN: To give an additional capability.

MR. FINLEY: That's correct. That's correct.

MEMBER RYAN: Thanks. That's helpful.

MR. FINLEY: Slide 17. This slide relates to internal flooding. And there is some work ongoing here in the Design Certification. Essentially we will address the internal flooding. We have an RAI response that is outstanding. We're awaiting the work to be completed in the Design Certification, and full confidence it will be resolved there. But if not, we'll address any site-specific aspects on our license application.

And fundamentally as you're aware, there's four safety divisions and we basically protect from

internal flooding by separating those four safety divisions.

Slide 18.

MEMBER SKILLMAN: Can we go back to the flooding just for a second, please?

MR. FINLEY: Which slide?

MEMBER SKILLMAN: That would be your Slide 16.

MR. FINLEY: Yes.

MEMBER SKILLMAN: The Chesapeake Bay's kind of different than an oceanfront plant. And oceanfront plant is going to live with the ebb and flow of the tide. Chesapeake Bay plant's going to live with whatever water buildup comes into the Bay from Hampton Roads.

MR. FINLEY: That's correct.

MEMBER SKILLMAN: And so if there's a prevailing storm that's pushing from southeast to northwest that will push water up towards Havre de Grace and up to Lusby --

MR. FINLEY: That's right.

MEMBER SKILLMAN: -- and if you were to have this event, the one that you're describing, during an eclipse where the moon's lined up properly, you could have in addition to the pile up due to the prevailing

wind, which is part of the storm surge, plus the wave action from the wind, you might have another couple of feet as a consequence of the tide change in a confined basin. How has that been addressed?

MR. FINLEY: So you ask a good question. But the analysis again addresses that. We actually have several layers in this analysis and we start with what is the maximum possible high tide, okay, which would include any lunar eclipse or --

MEMBER SKILLMAN: Neap tide or --

(Crosstalk)

MR. FINLEY: -- any alignment of the moon and sun and stars possible. So we start, and I think it's three or four feet, something in that range could be possible in terms of maximum tide. And then we take on top of that the worst surge.

And again the path of the storm as I explained is really the worst we think credibly possible. And then on top of that you have the waves, worst waves, and you run all that on the shore and up against the structure and the wave runs up on the structure, that's all part of this calculation.

CHAIR POWERS: But he has not taken into account the gravitational effect of the asteroid that's --

MR. FINLEY: I think we have, Doctor.

(Laughter)

CHAIR POWERS: Oh darn, I thought I caught you.

(Laughter)

MEMBER SKILLMAN: Thank you. Got it, thank you.

MR. FINLEY: Okay, I think we're on Slide 18. With respect to internal flooding for the site-specific structure, no need to go into details here, but basically our site-specific makeup water intake structure is divided into four divisions.

You have a makeup train in that building for each of the UHS cooling towers so it's aligned by the safety divisions in the Design Certification. And there are watertight doors and watertight walls in between each of those divisions, so that's how we protect from internal flooding in one part of the structure affecting other divisions.

CHAIR POWERS: We have seen some, what I would certainly think of as very heroic activities taking place at Japanese plants to protect against internal flooding. Have you looked at any of that to see if there's any lesson to be learned from what they're doing?

And they're responding primarily to tsunami kinds of hazards, but water is water. And some of the stuff that they're doing is, heroic is the word that comes to mind on that. But I mean they're clever engineers and they have clever designers and they may have things that are of interest. Have you looked at any of it to --

MR. FINLEY: I can't speak to specifics with respect to things the Japanese would have done recently, but I can speak to from a process standpoint in response to Fukushima lessons learned. We have a great source of input regarding lessons learned. We are of course owned by Electricite de France and they are taking some actions with respect to flooding for their fleet of plants.

We also have actions with respect to the beyond design basis loss of electrical power in terms of following industry in the flex guidance response. And so to the extent that we're following industry and we have input from EDF, which obviously is a part of the western European response, we have excellent input in terms of lessons learned and how they should be applied to the EPR.

CHAIR POWERS: So you're not insulated against that.

MR. FINLEY: Right.

CHAIR POWERS: But it's interesting because they're certainly doing some heroic things, and at least the engineering structures that I've seen on things like watertight doors and stuff like that they, it actually is a really interesting design work that they're doing there and it's intriguing.

It's truthfully a belt-and-suspenders approach that they're adopting but, yes, I'm not sure how much is engineering necessity and how much of that is public perception coming to -- yes, I don't know.

MR. FINLEY: Right.

CHAIR POWERS: Any time somebody's doing new design efforts I get interested just because I can always learn something new.

MR. FINLEY: And we, as I said, in terms of design basis I've explained to you our design basis and we follow the Design Certification closely. Of course with respect to beyond design basis there's really no sort of limit, and those issues are being addressed under our approach with the flex guidance which would follow the Interim Staff Guidance with respect to beyond design basis, the loss of AC power.

MEMBER SCHULTZ: So is it these issues and then the response to them that's affecting the RAI

response schedule in this area?

MR. FINLEY: To the extent that we follow, as I mentioned at the outset there are some RAI responses on the Design Certification that are open in Chapter 3 and a lot of those also cascade onto RAI responses that we still have open or open items that are still open.

With respect to Fukushima, there are a handful of RAIs that would address the issues that we've talked about in terms of beyond design basis. That's not the predominant reason for the open items on this chapter.

MEMBER SCHULTZ: Okay.

MR. FINLEY: It's more of the back to the seismic analysis for safety structures not being completed yet, and us at the Calvert site incorporating the central eastern U.S. seismic input. That's the predominant reason.

MEMBER SCHULTZ: Thank you.

MR. FINLEY: Okay, Section 3.5. This is Missile Protection. We'll start first with turbine missile analysis. So we have a COL item from the Design Certification to confirm that the probability of a missile generated from the turbine is less than 1E to minus 4 for turbine generators that are favorably

oriented with respect to the containment. So we've done that. We've done a specific, Alstom has done a specific analysis for our turbine design. It includes the inspections, the program that we would have with respect to preventing failures due to stress corrosion cracking, making sure we can detect cracks that could potentially cause failure before the next inspection interval ends.

And we've confirmed that our probability is less than 1E-4 with respect to the COL item.

MEMBER STETKAR: Mark, your probability that was calculated is, you know, I think it was 1.14 times 10 to the minus 9, which is A) very precise, B) very tiny.

I can't quite honestly figure out where the heck they came up with that number looking at the data that they cited. I've looked at the response to the RAI. I've looked at their turbine missile analysis and stock unit 75 RC-10001.

I can't figure out, given the monthly testing they've assumed on the turbine stop and control valves and the low-pressure intercept valves, how they calculated their failure rate per demand for those valves. I come up with a value that's about a factor of 20 times higher, roughly.

They've also not accounted for any common-cause failures of anything, of the valves in particular. I didn't look too much at the electronics because I don't have reason to believe that that's the driving force. They don't account for what's called a state of knowledge correlation. They don't do any uncertainty analyses obviously.

So this is not something you would put in a PRA, for example. It would never pass muster of a PRA because they've not accounted for common-cause failures or uncertainties.

It's not clear to me, quite honestly, because I'd have to assume some common-cause failures, and I don't have any data for those types of valves. My best guess is you're probably less than 1E to the minus 5, but you're probably not four orders of magnitude less than 1E to the minus 5.

Overall it may not make any difference functionally, you know, to the overall conclusion regarding acceptability of the design. Certainly you're going to be less than 1E to the minus 4. Whether you're less than 1E to the minus 5, I'm not quite sure. You're certainly not 1E to the minus 9. I don't know whether the staff has looked into the details of those calculations or they have any comments. It's

just an observation. I didn't see anything in the analysis or the data that the failure rates, even the failure rate that I came up with on a per-valve demand process is reasonable based on my experience. As I said, I can't figure out how they came up with their numbers, but the values that I derived from their data seem to be reasonable.

So even in that sense I don't think that you're vulnerable, so I'm not raising kind of a question regarding the fundamental conclusions regarding your turbine missile probability, but I don't have any confidence in the calculation they did. But their logic is correct, you know, I just don't understand how they derived a couple of their numbers. So I just wanted to make that statement. As I said, as far as the Subcommittee is concerned I'm not really questioning the overall conclusion that you have on this slide, it's just the details and how far you are away from that margin.

MR. FINLEY: So I appreciate that. And obviously your knowledge is extensive with respect to this calculation and --

MEMBER STETKAR: I just wanted to raise it and I knew you didn't have any --

MR. FINLEY: I can't speak to specific

issues. I can say that there are at least one maybe two open RAI question responses with the staff, so the staff will probably mention this as an open item. So we're not finished in terms of review of this analysis and this issue with the staff at this point.

MEMBER STETKAR: Can I ask you, do you know or do you have anyone here who happens to know, they've, in the text they've based their conclusions on a monthly test of the valves, the stop and control valves, intercept valves.

And what they say is a daily test of, an end test of the electronic overspeed trip mechanism out through the energizing the solenoid valves in the trip locks. Is that consistent with your understanding of what will be done?

MR. FINLEY: I can't say that I know the answer --

MEMBER STETKAR: I know these test intervals are directly related to the failure probabilities that they derive.

MR. FINLEY: I appreciate that. And we don't have, unfortunately we don't have our turbine engineer or Alstom representative here today so we'll have to take that --

MEMBER STETKAR: As I say, monthly, in my

experience is pretty consistent. The daily end-to-end taking it all the way out to deenergizing, you know, you it's a two out of three trip logic so you deenergize individually each one of the solenoid valves.

That is a little more frequently than I've experienced, but I'm not familiar with this particular overspeed trip design nor the practices of people who use, you know, these types of turbines. So that daily assumption or the daily test was, kind of stuck out in my mind.

So if you could clarify whether those are actually going to be used as part of the install practice, I would appreciate that.

MR. FINLEY: Okay, we'll have to take --

MEMBER SKILLMAN: I would like to reinforce John's curiosity here, because what I see is the 1.14 minus 9 for monthly in lieu of weekly, you know, John sees daily. So I'd be curious.

I'm familiar with monthly. Monthly seems to be the kind of pace of industry for most of the turbines that are out and about right now. And I would wonder whether weekly or daily is, in fact, setting up a different failure mechanism either in terms of hardware or operator action.

MEMBER STETKAR: No, that's one of my

concerns. The monthly valve stroke tests are pretty standard out in the industry. Some people even go out to once a quarter, because it's not a good day when you trip the turbine. And I don't care about, you do, but I don't care about energy production, I care about safety or initiating events. So you're balancing off a reliability of the turbine trip function versus vulnerability to a spurious turbine trip.

Monthly test of the valves people seem to, you know, be able to tolerate that. Occasionally you do get plants tripping because of it. It's a little bit more surprising if you're actually running the test out through the turbine control fluid solenoid valves because there's only three of those, you know, and actually deenergizing those, you know, making them move.

And as I understand it there's not a big description about it. They're actually doing that. You don't actually move the big valve, you know, providing that you have the solenoid valve isn't like stuck. When you open, you know, Valve Number 1, Valve Number 2 happened to be stuck a little bit and then you come in.

If you're actually doing that on a daily basis that again in my experience is a little more frequent than, a lot more frequent than people do.

MR. FINLEY: We'll have to take an action to get back to you on the specifics of the valve testing.

MEMBER STETKAR: And in fact, if they only do do that solenoid valve test once a month rather than, you know, once a day that would affect the associated numbers. That might actually get you over the 10 to the minus 5.

MEMBER SKILLMAN: Yes, this is in Section 3.5.1.3 and there is an RAI. It's Question 0305010323.

MR. FINLEY: As I mentioned, we do have some open RAIs on this topic so review is not complete. So we will have the opportunity with the staff and ACRS in Phase 4 to respond.

MEMBER SKILLMAN: Thank you.

MEMBER SCHULTZ: So in addition to the evaluation assumptions, the rationale associated with those assumptions would be what we would want to see.

MR. FINLEY: Understand.

MEMBER SCHULTZ: Is it this analysis that's driving it, and if not, then what is --

MR. FINLEY: Right, understand.

MEMBER SCHULTZ: -- the frequency of testing?

MR. FINLEY: Okay. Slide 21 speaks to turbine missiles from the existing units, and the

distance is such that the threshold value of 1E-5 is the criteria here, and the analysis for the existing units shows that we meet that criteria.

So Slide 22, this now moves to missiles generated by tornadoes and extreme winds. I spoke a little bit before about the fact that for the Seismic Category I structures we use the same tornado wind speed assumed in the Design Certification even though the Calvert tornado and wind is less.

Calvert tornado and wind as you see there, 200 miles per hour bounded by the 230 mile per hour wind speed for the Design Cert, so the missile spectrum used in the Design Cert is bounding for the Calvert Cliffs site.

Slide 23. Here we, again we looked specifically at the detachment of siding panels for the switchgear building. It's a non-safety structure, but we confirmed that these sliding panels in terms of missiles would be bounded by the missile spectrum that we use for the safety structures so there is no effect.

We also confirmed that the buried components including underground piping, duct banks, et cetera, are at a sufficient depth to be protected by any tornado-driven or extreme wind-driven missiles.

Slide 24. With respect to elevations

around the site, we have looked at the maximum elevation within a half-mile radius just to confirm that if you had an automobile on the top of that hill and it were picked up by a tornado that we would have the appropriate missile protection. And we have confirmed that up to the height that you see here we have adequate missile protection for this automobile missile.

Slide 25. With respect to other explosions that could generate missiles or potentially challenge the safety structures, we've done a suite of site-specific evaluations for the train and truck traffic or shipping traffic on the Bay, industrial facilities nearby, pipelines nearby, military facilities nearby, the aircraft patterns nearby, and applied the appropriate guidance in the Regulatory Guides that you see there, and none of these potential site-specific hazards resulted in any unacceptable impact to the Unit 3.

Moving on to Section 3.6, actually 3.6 is entirely incorporated by reference. Nothing really to speak to there in terms of any differences with the Design Certification.

I mentioned before that 3.7 will be addressed in Phase 4, so we're going to move to 3.8 which is the Design of Category I Structures. And I'm on Slide

28.

First, with respect to the layout of the generic structures, again in the powerblock upon the 85-foot grade we have no departures here from what's described in the Design Certification in terms of the layout of those structures.

With respect to the Category I structure that is site-specific, there are three of those as you see on the bottom of this slide, which is the UHS makeup water intake structure, and in addition, the buried conduit duct banks and buried pipe. Those are three categories of Category I structures that are site-specific, and I'll speak to those one by one.

So first, on Slide 29, the makeup water intake structure, and we include in this structure essentially the forebay, and the next slide shows you a little picture so you can visualize this.

But the forebay and the makeup water structure are Category I structures and they have an integral basemat. And the attached circ water makeup structure is a Category II structure, and all of these structures are built on a five-foot thick, common basemat essentially analyzed together.

A picture on Slide 30 from our three-dimensional model just shows you the layout here.

On the right-hand side of this slide you see the safety-related or Category I UHS makeup water intake structure, and then the center structure is the forebay. This is also Category I.

And then the structure on the left is a Category II structure that's a circulating water makeup structure or provides makeup to the main cooling tower. And then you see the blue pipes there. Those large 60-inch internal diameter pipes that lead to that portion of the intake that I talked about before, underground. They tie from the intake to the forebay here. So that's essentially the layout of the site-specific safety structure.

Slide 31. Sticking with the UHS makeup water intake structure and forebay, the reinforced concrete shear wall and slabs are designed for seismic loads. Exterior walls are designed against tornado and missile impact.

We've also designed the structure for the worst wave pressure during the Probable Maximum Hurricane, and also the Standard Project Hurricane wind environment. And we checked the structure for sliding, overturning and flotation, all of the appropriate analyses for this structure.

Slide 32 continues with this same

structure, and this talks about the critical sections in Appendix 3E. We've identified the critical sections and provide those in Appendix 3E. I don't think there's anything specific I want to say about that but we follow all the appropriate methods in terms of design for the structure.

Slide 33 moves away from the makeup water intake structure to buried duct banks and buried piping. So we have to run duct banks, these are electrical conduits that are encased in reinforced concrete, and buried pipe which is not encased in concrete.

We have to run those utilities up from the makeup water structure to the powerblocks, so we have site-specific runs of this underground duct bank and piping. And we assure that we have the required protection and depth, structural fill, et cetera, for these underground structures.

Slide 34 just shows a plan view of where these underground structures run. So at the top of that figure you can see the makeup water intake structure, and essentially we run those underground facilities up from the Bay to the powerblock at grade 85-foot. So we designed a specific piping and duct bank run up to the powerblock.

MEMBER STETKAR: What have you done to

protect the cable duct banks in particular from water intrusion, or what will you do?

MR. FINLEY: Yes, so actually --

(Crosstalk)

MR. FINLEY: The next slide, or coming up may be a better spot to talk about that if I can defer your question.

MEMBER STETKAR: No problem.

MEMBER SKILLMAN: What's the distance from the makeup water structure, the UHS structure up to the aux building and the reactor building?

MR. FINLEY: I'm going to ask, just so I don't misquote a number I'm going to ask Shankar Rao if he can help us.

MEMBER SKILLMAN: Is it maybe a half a mile or something like that?

MR. RAO: It's almost 3,000 feet.

MEMBER SKILLMAN: A little over half a mile.

MR. RAO: I'm looking at the extreme end of the powerblock where we have to run the pipes to the extreme end of the other one, so maximum, approximately.

MEMBER SKILLMAN: You have two 60-inch headers coming up, is that what you've got?

MR. FINLEY: No, no. So --

MR. RAO: That's only from the forebay to the intake structure as you had noticed in the top left-hand area, bottom line shown there. These lines are only about 300 to 400.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: So Slide 35 --

CHAIR POWERS: On your cable runs, if you pour water into it at the powerblock it's moving at a fair velocity by the time it gets down to the Bay area.

MR. FINLEY: That's correct. So you're speaking about how we would address drainage with respect to this buried duct bank?

CHAIR POWERS: That's right.

MR. FINLEY: Perhaps Shankar from Bechtel can explain that.

MR. RAO: Buried duct banks are basically provided with some kind of protection around them for any water intrusion. However, in addition to that for any water that can get in we do have a drain piping at the bottom of the duct bank which will take any of that water down to the slope side, you know, towards the intake area.

CHAIR POWERS: Yes. It ends up someplace. Where does it end up?

MR. RAO: It will end up in the forebay part

of the intake structure.

CHAIR POWERS: So you just drained it back into the forebay?

MR. RAO: Yes. I mean where the duct bank and it basically ends in the area of the pumphouse. It'll have a drain pipe that will end up eventually at the forebay for the pump.

CHAIR POWERS: I guess I'm not seeing, not quite understanding how this works. I mean the concern of course is that I've got a bunch of polyvinyl chloride here and I've got water moving past at, moving at a fair velocity, and what is it doing to the polyvinyl chloride?

MR. RAO: Your question relates to --

MR. FINLEY: Is this water, I think Dr. Powers is concerned that the drainage water would impact the polyvinyl chloride or the conduit and have some negative effect.

MR. RAO: Erosion?

CHAIR POWERS: It could, I mean --

MEMBER STETKAR: Do you guys, and you may since we're kind of scheduled for all day, I don't know if we'll run all day, but do you have anywhere in the back of documentation a cross-section of one of the duct banks. That might help all of us with --

MR. RAO: Based on RAI response we have provided which is RAI 333, provides a cross-section of the duct bank and details regarding the duct bank. The RAI response was essentially submitted.

MEMBER STETKAR: Okay, we could not get a hold of the RAI responses nor would we want them.

MR. FINLEY: We provide more details in terms of the cross-section of each individual duct bank, perhaps it might help.

If you look on Slide 34 there's a, it's kind of difficult to see here, but it shows you sort of a high level layout of the duct banks and the underground piping that are run more or less together in a trench which is filled with compacted backfill. So you see, I don't have a pointer here that works, but you can see sort of that trapezoid.

MEMBER STETKAR: You can use the mouse. It works.

MR. FINLEY: Yes. That shape right here shows essentially the buried duct banks and buried piping that lay in the bottom of this trench under a structural fill and then there's backfill on top of that. So that provides protection in terms from external effects.

MEMBER STETKAR: What I was asking for is

a better picture of what the arrow is pointing toward. It says electrical duct bank.

MR. FINLEY: Right, right.

MEMBER STETKAR: And it shows how that's actually constructed.

MR. FINLEY: We have that on the docket so that it can easily be --

MEMBER STETKAR: And to understand how the drains from those things, are the drains that you're talking about draining individual duct banks or are they draining this geometry?

(Off the record discussion)

MR. RAO: The individual duct banks have multiple ducts in it for the electrical raceway. In addition to that at the bottom of the duct bank there's a specific piece of pipe, I will say, which takes the drain from any seepage coming into the duct bank.

CHAIR POWERS: It's like a French drain is what you've created here. It also presumes that from the power pole out to the forebay it's always sloped down. It doesn't do any, like this.

MR. RAO: It's continuously sloped, such of it that all the water does drain out of the ducts.

MEMBER STETKAR: There's, I think, a statement in your FSAR that says the groundwater level

is 30 feet, roughly, below site grade. That can't be true all the way out to the ultimate heat sink.

MR. FINLEY: So we'll have another slide to speak to --

MEMBER STETKAR: Okay.

MR. FINLEY: -- the underground water, maybe we'll hold off on that. But certainly staff --

MEMBER STETKAR: Part of this is, if the groundwater level is equal to or greater than the level of the duct bank, water can come back in through your, as Dana has characterized, French drains. It's not an engineered, you know, act of pumping system or something like that. Water can come back through the thing that you're taking credit for draining things out. Follow me?

MR. FINLEY: Yes. Okay, so we'll have another --

MEMBER STETKAR: If you can help us perhaps in real-time, if you have readily available a picture of that duct bank it might help, and even at the break perhaps.

MR. FINLEY: Okay, we'll try to capture something at least electronically.

MEMBER STETKAR: Yes, we don't get the RAIs, and the problem is if we ask for them we'll get

them and we don't really want them because that would require me to read them.

(Crosstalk)

MR. PARK: My name is Sunwoo Park, structure engineer, Structure Engineering Branch. I have reviewed this section and we identified that there is a duct bank drain, a six-inch drain pipe indicated in the drawing provided as part of a RAI response from the Applicant.

MEMBER STETKAR: Good. And that's the picture that I'm kind of asking for here that obviously exists.

MR. FINLEY: We'll try to catch that during the break.

MEMBER STETKAR: Thank you.

MR. FINLEY: Okay, and Slide 35 just provides some additional detail with respect to how we design buried duct banks and buried pipe. We will follow the AREVA Topical Report that you see there with respect to buried duct banks and pipes, and obviously we'll follow the specifics of the topography and the geotechnical issues at the Calvert Cliffs site including water and drainage of water.

And buried pipes are located such that the top surface of the pipe is below the site-specific frost

depth, with additional depth used to mitigate any effects of surcharge loads, tornado or turbine generated missiles.

In Slide 36, with respect to further criteria for design of buried pipe and duct banks, again we follow the AREVA Topical Report and we'll also follow the appropriate IEEE and other industry design guidance as you see there.

Slide 37 moves to loads and load combinations. And in Calvert Cliffs FSAR Table 2.0-1 we do compare the Calvert Cliffs Unit 3 site characteristics to the parameters that define the basis for the U.S., these Design Certification design loads.

And since, with the exception of a low frequency range for the site-specific safe shutdown earthquake, all of the site-specific loads are confirmed to be bounded by the Design Certification loads. And there will be a detailed site-specific reconciliation performed so that we'll confirm that the in-structure response spectra for the Calvert Cliffs 3 site is bounded by the Design Certification in-structure response spectra.

Slide 38. There are some specific loads that we address for the site-specific Category I structures. With respect to rain, snow and ice we use

a site-specific input there. With respect to the lateral soil pressure we use the specific soils at the site.

And with respect to the safe shutdown earthquake we use a peak ground acceleration slightly lower than that of what's in the Design Certification, 0.15 g as opposed to 0.3 g used in the Design Certification. This is bounding for the Calvert Cliffs site.

MEMBER SKILLMAN: Let me ask a question here on 38, please. In the last four or five years, the East Coast has seen a number of major weather events, particularly precipitation. Very heavy rains, very large quantities of moisture. And at least in my experience of living on the East Coast for my lifetime, these are different.

What consideration has been given to ensuring that particularly the rain and snow loads and the ice that may come from winter precipitation is really bounding when you're looking at the next 50 years for this plant?

MR. FINLEY: I'm not familiar with the specific methodology with respect to how we built up the assumption made for rain or snow. I can tell you we used the regulatory guidance that's out there now.

In terms of any margins to address potential further increase from weather events that might occur, I can't speak to that.

CHAIR POWERS: We just don't that. And I mean it's a generic issue that we have with all these design, it's more of a Design Certification issue than it is some actual, I mean it comes back into the fore here.

But, you know, we've got, what they do is they look at things historically. Now we have people coming along telling us, gee, weather moves in cycles and on top of that you may have a global warming sort of thing that changes all these things, and so the history's no longer any good to you.

And these guys are kind of stuck because they've got a guidance, and we're asking, what do we do about this guidance? Because I mean you guys are kind of stuck. There's not a lot you can do. It's okay there's not a lot they can do about prognosticating, you know, prognostication is difficult especially when it's about the future.

And I mean it's just a horrible thing because you're talking about a plant where we're setting up a design for 60 years in the future, and I have a hard time planning things beyond lunch today. And it's

just difficult.

I don't know. I mean I think the staff has to work that more as a generic kind of issue but I don't really think there's any resolution, because my reading of the meteorological community is that they don't have a consistent story to pass on to the staff, and staff's not interested in becoming experts on weather, and so they're kind of dependent on the meteorological community coming along and telling them what to do. I mean we're kind of stuck there, and so I just wanted --

MEMBER SKILLMAN: I know of one instance where the facility was designed for a certain rainfall, precipitation rate, 11-12 centimeters an hour that set the parapet design and the downspout design and the roof design. And those of us who were involved said let's go up a notch, because there are basically isobars on a weather map that suggest how much rainfall you can have in certain geographical portions of the country.

It turns out that that almost arcane change to notch up by one isobar to the higher level saved the day because that location in Hobbes, New Mexico, there was actually a weather event that moved 400 miles further to the north, and had we used the lower amount the parapets and the flooding at the site would have been

compromised.

So the things that an owner can do that are very inexpensive on the front end, simply to say, hey, let's take it up one notch. And if the design is, I don't know, 13 centimeters an hour, let's take it to 15. Doesn't cost a whole lot on the front end but it eliminates the question, how in the world do you handle this massive rainfall that we kind of thought might happen but the weather chart didn't show that it would happen.

CHAIR POWERS: The trouble is, Dick, that okay, take it up one notch, and why don't you take it up another notch?

MEMBER SKILLMAN: Okay.

CHAIR POWERS: I mean there's just no end to it.

MR. FINLEY: Well, I certainly agree with the premise that it's smart to have margin, especially in areas where there's potential changes occurring in the future. And in general I can say that we use that philosophy that we don't just take the minimum allowed by regulation.

I can't speak to the specifics in this case. I think there was some review in the portion of Chapter 2 that we've already reviewed with you with respect to

how we set up the basis for precipitation, but it escapes me now in terms of the margin we have. I'll look to Shankar. Any comments you can make with respect to margin? Or Todd?

MR. RAO: As far as I can tell is that there is a table in Chapter 2 which basically sets the limits on what was used for the analysis. On top of it we do have margins that we do the design of structure, systems and components from that analysis. So inherently there is additional build-up that we've incorporated into the design.

MR. OSWALD: This is Todd Oswald with AREVA. One thing that may help, I heard where parapets were mentioned. We've eliminated parapets for that reason so that we don't have that build-up. You know, the ice blockage was a big issue with the parapets also.

And also in your concrete design codes you have load factors on top of what your predicted value is, 19 inches per hour or whatever. So you have, and I'm drawing a blank on the load factor on that specific load. I want to say it's 1.7, but I have to verify that.

So the design code's kind of built in so additional uncertainty in the loads. So you have your deterministic, or I guess, probabilistic number that you're designing to, and then you factor with your loads

factors in the ACI design code.

MEMBER SKILLMAN: Thank you. That's fair enough, thank you.

CHAIR POWERS: It is just a conundrum for us right now, and I don't know what advice we, I think it's kind of independent of this. It's every single one of these design reviews and every single reactor, we've got a problem of what to do with this use of historical information.

The other probabilistic problem that we have with that is we use 50 and 100 years, which even if that date is applicable creates 10 to the minus 2 kinds of events, and yet we're all operating in 10 to the minus 4 kind of space. We just flat don't have the data.

I mean the Indians just weren't good weather keepers. That's all there is to it. If they kept better weather records we'd be in better shape.

MR. FINLEY: Okay, so I'm going to move to Slide 39, and we're still talking about loads and load combinations for site-specific safety structures. And specifically for the makeup water intake structure we do consider the wave pressure on exterior walls concurrent with hurricane wind pressure, and we also have a peak positive overpressure of 1 psi assumes inside

the structure.

Okay, so Slide 40, here, Dr. Stetkar, we come to the groundwater question. So there are some specific issues related to groundwater at the Calvert Cliffs 3 site.

So the groundwater which is essentially below the 30-foot elevation, remember now the plant grade is 85-foot elevation, 30 feet below that is where we predict the water table to be at sort of a maximum height. So you essentially have 30 foot of damp soil but you don't get to the water table until you go down 30 feet at the powerblock elevation.

MEMBER STETKAR: At the powerblock.

MR. FINLEY: Right. Now the makeup structure is different so we'll come to that, but let me speak first about the powerblock structure. First, that the groundwater at that 30-foot below ground and lower is aggressive with respect to low pH, high sulfates and chlorides, so we have to do things to address that.

And what we've done is basically installed, will install a waterproofing system that will protect any portions of the powerblock structures that are below that water table level. It's essentially an impermeable boundary that prevents this water table from intruding toward the concrete of the safety structures.

This is for the nuclear island structure in particular because that structure goes below, down to about 40 feet below grade, so there is a portion of that structure that would be down below the water table.

For the emergency power generating buildings, EPGB, and essential service water buildings, they are not below the water table so their foundation is above that 30-foot level below grade.

Duct banks, we have not done all the detailed design to run the duct bank from the Bay up to the powerblock at this time but they will protected as necessary. We expect that given that the duct banks will be running from the Bay level up to the powerblock level that there will be a need to apply waterproofing protection as necessary. Similarly, the buried pipe would also have protective wrapping and/or coating.

MEMBER RYAN: How are these areas going to be protected from infiltration and surface water? You've got them in an unsaturated zone and a saturated zone. What you've explained I take to be the saturated zone interaction. So what's the unsaturated zone interaction as well?

MR. FINLEY: So just to describe at a high level, the system. So we have, I think, two or three feet away from the concrete structure we'll have this

impermeable barrier, so waterproof barrier, then we'll have monitoring wells within that two or three feet which will demonstrate to us that that area stays dry. And we'll have the capability to dewater if necessary but we don't believe that will be necessary.

MEMBER RYAN: What's dry?

MR. FINLEY: Well, I think the important thing is in terms of aggressive environment, what's aggressive is not the rain water that drains through the damp soil, it's actually being immersed in this water table is really what's aggressive. That's what creates the low pH situation, the surficial water itself is not aggressive in that respect. So it's really why the design of this system is geared toward that water table and the saturated area, to make sure that we don't come into contact with the concrete.

MEMBER RYAN: What's the typical infiltration in terms of inches per year in this area, nine or ten, something like that?

MR. FINLEY: Typical infiltration, I don't know to answer that. Shankar, any --

MR. RAO: The question, sir?

MEMBER RYAN: Of the rainfall that hits the site, how much infiltrates per year? You probably get 40 inches per year. What's the recharge?

MR. RAO: We would have to take that test.

MEMBER RYAN: Okay. I guess what I'm just trying to get at is this is a very dynamic system. You're on the coast, you've got rain coming in at forces, you know, taking the saturated zone out.

But I think it's important to give us a feel for how the top system is interacting as well as what you've done very well which is talk about how the saturated system and its chemistry and so forth you've addressed, so then how does it interact with the surface system?

MR. FINLEY: We'll take that action.

MEMBER RYAN: Thank you.

MEMBER SKILLMAN: With the surface water, are you aware of the alkali-silica reaction issue that is alive and well at Seabrook, and if so, have you taken that into consideration for this design?

MR. FINLEY: I am aware of that at least at a high level. I think I'm going to defer to Todd Oswald from AREVA to speak.

MR. OSWALD: Yes, this is Todd Oswald from AREVA. We have received the RAI in response to the Seabrook and we have invoked the required ASTM testing to test, and the concrete mix design would account for that.

MEMBER SKILLMAN: Thank you.

CHAIR POWERS: Of course, the fundamental problem is if the Seabrook unit is viewed with the ASTM test that is extant at the time it was built on that subject which is different than the current test. They passed that test. So how good is our current ASTM test?

I don't really expect you to have an answer to that, but that is the question on this alkali attack. It didn't seem to make a lot of difference on the concrete.

MR. FINLEY: So I understand that's an issue that's still open with respect to the Design Cert, and we'll follow that and certainly use the concrete recipe and test that would resolve --

CHAIR POWERS: You have not seen any alkali attack on your existing units?

MR. FINLEY: Not to my knowledge. Not to my knowledge.

CHAIR POWERS: That may speak to your level of ignorance rather than the facts.

MR. FINLEY: I should also say that I have not been involved in the details of the Calvert 2 operation recently so I can't say that I should know. So I don't know.

CHAIR POWERS: Yes, I mean it seems to be

the answer. The system is fine concrete. It's good and they've used that.

MR. FINLEY: Right. I will speak also with respect to the makeup water intake structure and this groundwater issue, as we mentioned the surficial aquifer is below 30 feet, but that aquifer is not in place at the Chesapeake Bay where the makeup water intake structure is.

That groundwater is different characteristics than this aquifer up on the powerblock area. Therefore, we don't have the same aggressive challenge to the makeup water intake structure with respect to the groundwater.

MEMBER STETKAR: The aquifer dips down as it gets to the Bay?

MR. FINLEY: It does. It does. I wish I had a cross-sectional view here. So the makeup water intake structure isn't subject to this same aggressive environment as, it does have a different challenge.

As I mentioned at the bottom here, we do have brackish water there at the Bay and we have responded to some questions from the staff on that. We think that the concrete water-cementitious materials ratio that we will use and the compressive strength of that concrete will prevent any issues with the brackish

water.

MEMBER STETKAR: Back up to the first large bullet there. You said that the emergency power generation buildings and essential service water buildings are not affected because they're above the water table.

Will the geomembrane extend under those in addition to the nuclear island or not? You know, I'm looking at kind of a cross-section drawing here but only of a building.

MR. FINLEY: Let me ask Antonio.

MR. FERNANDEZ: No. This is Antonio Fernandez from UniStar. No, the geomembrane system isn't a nuclear island.

MEMBER STETKAR: They're only in the nuclear island.

MR. FERNANDEZ: Can you confirm that, Shankar?

MR. RAO: Yes.

MR. FERNANDEZ: Yes.

MEMBER STETKAR: And once you may have mentioned it or I may have missed it, what's the current difference in elevation between the bottom level of the EPGBs or the essential service water building, whatever the --

MR. FERNANDEZ: Yes, the EPGB --

MEMBER STETKAR: -- and the groundwater elevation?

MR. FERNANDEZ: The EPGB foundation elevation is about six feet below grade, so that's pretty high. And the ESWB is about, it's just above the groundwater elevation.

MEMBER STETKAR: Just above.

MR. FERNANDEZ: Just above the groundwater elevation. It's 28 feet below grade.

MR. FINLEY: I should also say that's a 30 --

MEMBER STETKAR: So it's nominally two feet sort of, kind of margin.

MR. FINLEY: And of course we'll confirm that by monitoring. The 30-foot is a maximum. It's not sort of a realistic level.

MEMBER STETKAR: Well, obviously, you know, my concern is if that, you know, what sort of margin, if you're not actively protecting the bottom of those other structures what sort of margin do you have against, you know, unforeseen, but again we can't predict very well, but unforeseen changes in the future. If that groundwater elevation were to increase by three feet are you vulnerable, for example?

MR. FERNANDEZ: It would have to be a permanent condition in the groundwater elevation which will not be the case. It would have a raceway. We don't -- this would have a race but then it would have to go back to a steady state.

MR. FINLEY: And we would also rely, and I think the next slide talks about some of the details of a monitoring --

MEMBER STETKAR: Yes, I wanted to get to some of the physical things first before the monitoring.

Unfortunately I didn't get a degree in chemistry as some folks here did, so I don't anything about high density polyethylene geomembranes except for the fact that I have had experience with them as surface covers for waste disposal areas. And I know they're really susceptible to degradation by ultraviolet light. I don't know how well they perform in an underground environment over 60 years.

Perhaps Dr. Powers might know that so I might ask him, or I'll ask you. If you're taking credit for this geomembrane to protect the buried surfaces of the nuclear island, in particular, do you have good confidence that indeed it will remain intact for at least 60 years?

MR. FINLEY: The answer is yes, but I can't

explain the basis so I'm going to let --

MEMBER STETKAR: I was just going to say, you know, yes based on the people who are selling you this stuff or based on you've actually had this particular material buried in the ground for 60 years and can confirm that it survives?

MR. FINLEY: I answer it yes based on the processes that I know that we have in place to look at those things. I can't give you the basis here. I'm going to look --

MEMBER STETKAR: You can defer it to the next slide where you talked about your --

MR. FINLEY: We're going to rely on monitoring but before we go there, Shankar, any comments about the design life of the membrane?

MR. RAO: There are test data available. We can probably provide that.

MEMBER STETKAR: You know, as I said I'm perfectly familiar with their use in surface areas, but there it's a different, it's an ultraviolet light.

MR. RAO: High density --

(Off microphone comments)

MEMBER STETKAR: Okay, by the sheeting but, and it's just that I'm not a chemist nor a materials engineer.

MR. FINLEY: Obviously it's something that we want to confirm we'll have the design life we expect. It's not going to be easy to repair certainly.

MEMBER STETKAR: Just jack it up and slip some more in there.

MR. FINLEY: But I think it is important to talk about the monitoring program which we will have. We'll also have the dewatering capability. As I said we don't expect to have to use that, but we will have a dewatering capability to assure that we don't allow, from a long-term standpoint we don't allow any aggressive groundwater to come into contact with the concrete.

But we'll have a baseline program prior to excavation, after we complete backfill, and then at six-month intervals thereafter. And then after the backfill is completed we'll have a trending program. So we're going to continue to monitor this and evaluate the need for dewatering provisions if we find that necessary.

Then on Slide 42 also with respect to Section XI requirements regarding examinations and settlement monitoring program, we will have inspection programs in accordance with ASME Section XI, Buried Components, as you see there.

We will also have a settlement monitoring program that meets applicable regulations in the Reg Guide 1.160. And we'll have to perform required evaluations if any of the settlement that we monitor exceeds our expectations, and certainly any design requirements as well.

MEMBER STETKAR: Mark, as I understand it, the piping that comes up from the makeup, the intake makeup water facility, is directly buried in soil, right. I know it's engineered backfill and things like that but it's directly --

MR. FINLEY: That's correct. It's not a bank, a concrete --

MEMBER STETKAR: It's not a concrete --

MR. FINLEY: Right.

MEMBER STETKAR: -- pipe bank. You mentioned somewhere, either you mentioned or I read that certainly the piping's going to be coated. Is that carbon steel piping?

MR. FINLEY: Yes, we did mention that we'll have appropriate coatings or wrappings as necessary when we do the detailed design with respect to the region that the piping is passing through in terms of groundwater.

In terms of the material for the piping --

MR. RAO: The material for the piping, which is mainly the brackish water from the intake makeup system ,is the high austenitic stainless steel. It is AL-6XN is the commercial name.

MEMBER STETKAR: I think you still have open items on the piping inspection, is that correct?

MR. FINLEY: I believe that's correct, yes.

MEMBER STETKAR: So I guess we'll follow that when those get further out. The question is, you know, we get involved in license removal stuff quite a bit and this substantial guidelines about inspection requirements for buried piping systems in -- if you want to write down the reference it's NUREG-1801, Section XI.M, like Mary, 41.

And those have been discussed considerably over the last two or three years as part of the license removal framework. I would hope that you'd be considering similar inspection commitments. It has to do with the type of material, whether it's coated, whether it's buried directly in soil, whether or not it has cathodic protection and so forth.

MR. FINLEY: Right.

MEMBER STETKAR: I don't know whether the open item addresses that particular issues or other, but we'll find out from the staff on that.

MR. FINLEY: Right. And in general terms, in terms of our inspection program we commit to follow the industry and the guidance that's in place, I think, within in one year, I want to say, of actual implementing the program. So we commit to upgrading our program corresponding to regulations or the industry.

MEMBER STETKAR: I was going to say, since this is a NUREG though, you know, I'm not sure how it is consistent, quite honestly, with ASME Section XI. I'm not that well versed. I just don't know.

MR. FINLEY: I'm not either. So that's one we'll have to take up for --

MEMBER STETKAR: It's just, I bring it up because it has been a somewhat contentious issue over the last two or three years. The inspection requirements were elaborated in much more detail in the current revision of that NUREG compared to the earlier revision that was in place, whatever it was, three or four years ago, and are pretty explicit.

MR. FINLEY: Okay. We'll take that action.

MEMBER SCHULTZ: Mark, just back up for a moment. That was where we were talking about the monitoring system to the groundwater monitoring system --

MR. FINLEY: Yes.

MEMBER SCHULTZ: -- the previous slide. I'm surprised. Not really concerned, but surprised that the plan is to look to back away from the monitoring program after one year. If, in fact, there is some trend identified, I would think that that monitoring program ought to be in place. It doesn't sound like it's going to be a difficult process to monitor and perhaps retain. I'm surprised that it's going to be --

MR. FINLEY: Maybe the wording, I think, is confusing here. I'm on Slide 41. What we say there is we institute a trending program one year after the backfill is completed. We don't discontinue that program. That program continues throughout the life of the plant.

MEMBER SCHULTZ: Okay.

MR. FINLEY: So we're not stopping at a point and forgetting about it. We're going to continually monitor this.

MEMBER SCHULTZ: And the evaluation trend or time, interval time, is going to be adjusted accordingly to the data seen.

MR. FINLEY: That's correct. Our program would be adjusted based on the trending that we see.

MEMBER SCHULTZ: But it is a plant-lifetime

program?

MR. FINLEY: Yes.

MEMBER SCHULTZ: Thank you.

MR. FINLEY: Yes. Okay, I think I spoke to Slide 42. Slide 43. Okay, so this is with respect to some specifics on shear transfer between the basemats and site-specific soil characteristics.

Okay, one of the questions, I think, that was raised earlier with respect to coefficient of friction, and I think there's been some recent occurrences in this area, but we no longer have a departure here based on our submittal to our response in the fall time frame.

And I think some complementary changes that have gone on in the Design Certification based on site-specific analysis of our soils and our geomembrane that we just talked about, we will meet the criteria specified in the Design Certification as of this last fall. So we don't expect to have a departure here.

Antonio, something else?

MR. FERNANDEZ: No, I think that's accurate.

MR. FINLEY: Okay.

CHAIR POWERS: Maybe you could be just a little more explicit in your first bullet. It comes

down and says, undrained strength greater than or equal to a drained strength of 26.6 degrees.

MR. FINLEY: Can you speak to that, Antonio?

MR. FERNANDEZ: That might be a, okay, cohesive soil case with undrained strength. Yes, the way that the soil provides its shear resistance could be under drained or undrained condition depending on the characteristics of the soil and of course on the saturation conditions. And eventually either of two, they both translate into a shear force.

So we can calculate that shear force either with a drained condition or an undrained condition and that shear force that ultimately we're going to be comparing either if it comes from --

CHAIR POWERS: What you are saying is that when it's undrained its strength will be up to what it would be if --

(Crosstalk)

MR. FERNANDEZ: -- with 26 and --

CHAIR POWERS: -- and you had a slope of 26.6 degrees.

MR. FERNANDEZ: Correct.

MR. FINLEY: Okay, moving on to Slide 44. This speaks to angular distortion of the basemat, and

first, for the NI Common Basemat. So in the analysis of basemat distortion done for the Design Certification they did use the site-specific soil spring values for our site, and in that process then confirmed that the distortion that we would have for the NI basemat is acceptable for Calvert Cliffs.

Slide 45, though, with respect to the diesel generator building and the central service water building we do have some outstanding work to do here. There will be a need to do some site-specific analysis with the Calvert soils to confirm that the distortion of the basemats for these structures is acceptable. So that's still open.

And then on Slide 46, specifically with respect to maximum differential settlement or tilt, we do have a departure here and this is, we have a departure and an associated exemption because it is a Tier 1 requirement in the Design Certification.

So we've had to do some specific analysis of this tilt and what that means in terms of the design moments for the structures, the diesel structure and the ESW structure. And we demonstrated that the results show that the design moments that we have with our higher tilt are bounded by the design moments that are calculated in the Design Certification. So we provided

that basis with respect to the departure.

And moving on, move now into Section 3.9 which is Mechanical Systems and Components.

CHAIR POWERS: What is that, does that say that the design is not consistent on the moment versus its differential settling?

MR. FINLEY: We will have differential settlement potentially that could exceed the criteria established in the Design Cert. Of course if you meet that criteria then you can be sure you're bounded in terms of any new moments that are introduced by this differential settlement.

We may not be bounded for these two structures, therefore we've done some additional analysis using site-specific inputs to confirm that any design moments, any stresses on the structure are bounded by what's calculated in the DC.

Okay, in the Section 3.9, and I'm on Slide 48. We have COL information items that relate to pipe stress and piping support analyses, and the programs that we would use for performing those analyses. We have provided a list of those programs in our FSAR and we are consistent with the Design Certification methodologies here. Of course all this work is not done yet. As part of the detailed design we'll do the piping

analysis and the support analysis.

Slide 49. This relates to preparation of design specifications for ASME Class 1, 2 and 3 components. We rely on the Design Certification for all of the generic ASME Class 1, 2 and 3 components, so we piggyback on the work that AREVA's doing here for the Design Certification.

We will also, for the COLA, perform the design specifications for the site-specific Class 1, 2 and 3 components, and some of that work is ongoing so we have an open item to track review of those specifications that are done for Calvert Cliffs 3.

Slide 50. It's sort of a similar or related open item related to the design specification questions. Part of the development of the design specifications will be to perform the appropriate stress analysis for any ASME Class 1, 2 or 3 components.

And again for the most part we rely on the Design Certification calculations for stress here. We do have an open RAI though for Calvert Cliffs 3 site-specific calculations and that will be completed in the future.

Slide 51 speaks specifically to the reactor core support structure and the stress analysis for the core support structure. We believe this will go away

from a site-specific standpoint because it really is a generic Design Certification issue that AREVA is currently addressing under the Design Certification. So we think this will go away for Calvert Cliffs.

Slide 52. Similarly there are some issues with respect to stresses induced by thermal variations in the feedwater line and other locations. And we have an open RAI on this, but as does AREVA on the Design Certification we think the work that they're doing because these are generic systems and generic concerns should cover for us. But we do have an open item on that.

Slide 53. This has to do with functional design qualification and inservice testing program for pumps, valves and restraints. We incorporate by reference the programs that are described in the Design Certification. We have some supplemental information with respect to the site-specific pumps and valves that we have as we talked about UHS makeup system, et cetera.

But generally we follow the Design Certification as applied to site-specific components here, which moves us to Section 3.10 and 3.11, which is Seismic and Dynamic Qualification of Mechanical and Electrical Equipment, and Environmental Qualification of Mechanical and Electrical Equipment.

And not too much to say here except that we do have site-specific tables in Section 3.10, Table 3.10-1, which lists the seismically and dynamically qualified components which are site-specific, which are not covered in the Design Certification, so we have a list of those that will be covered by these programs for the Calvert Cliffs 3 site.

Similarly for, on Slide 56, environmental qualification. We do have a specific list, Table 3.11-1, of the components that will be subjected to an environmental qualification program. The program itself will follow the Design Certification just applied to our site-specific components. Nothing really more to say there.

CHAIR POWERS: Typically these components, you order them and you tell the vendor, comply? You don't test them yourself.

MR. FINLEY: That's correct. That's correct. So this gets back to the design specifications that we create to procure these components that would include the requirements of these programs, yes, both mechanical and environmental qualifications.

And then finally, Section 3.12, which is ASME Code Class 1, 2 and 3 Components, Slide 58. So in terms of the in-structure response spectra for design

of our components we will use the in-structure response spectra that AREVA has created in the Design Certification for all those components in the generic buildings.

So even though we used a site-specific earthquake we could come up with a lower in-structure response spectra, we're not going to use that. We're going to use the in-structure response spectra generated by AREVA so it's bounding for the Calvert site in these generic structures. So we'll be able to use standard components and standard design criteria.

Now with respect to the site-specific structure, that makeup water intake structure, we also have pipes and components there obviously. Here we will use a site-specific in-structure response spectra too as a basis for qualification of these components.

And then last section, Section 3.13, really nothing to add. It's all incorporated by reference. This has to do with fasteners.

CHAIR POWERS: I was hungry to go through this. I'm really into the bolts and screws.

MR. FINLEY: I'm not going to say anything more about fasteners.

CHAIR POWERS: I'm disappointed.

MR. FINLEY: So just to summarize, on Slide

61 I did talk about the one departure, and I think we discussed the other previous departures that have been since removed. We have no ASLB contentions. There are 76 COL information items. We've talked about most of them here today but probably not every one.

There are 16 requests for additional information which are still outstanding and are scheduled to be responded to over the next several months. I'm sure the staff will speak to those RAI responses. That's all I have, so unless there's other questions.

CHAIR POWERS: Typically, staff wouldn't schedule these things unless they see there's a path to resolution --

MR. FINLEY: That's correct.

CHAIR POWERS: -- and you concur with that --

MR. FINLEY: We concur with that, yes. All of these, we think, there's a solid path to resolution, yes.

CHAIR POWERS: Are there any additional questions you'd like to pose for Mr. Finley and his team? I would say speak now or forever hold your peace, but we've got the whole day.

MR. FINLEY: You have one more shot.

CHAIR POWERS: And then we've got the whole day. The target's on you for, until the gavel hits.

MR. FINLEY: We did have the one action, I think, about the section of the duct bank so we'll try to get some --

CHAIR POWERS: Yes, that would be useful for us to understand just a little bit better. And if you could also give us a little more feedback on this polyethylene. I don't think we're looking for anything special. We're just looking for what you think its integrity is over 60 years.

MR. FINLEY: We'll try to do that today. If not, certainly we'll follow up.

CHAIR POWERS: Yes. I think it's maybe just pointing to a particular page in the documentation.

MR. FINLEY: Okay.

CHAIR POWERS: We are scheduled at this point to take a break until 10:45, and barring, if there are no objections from the members of the committee I will take a break until 10:45.

(Whereupon, the foregoing matter went off the record at 10:26 a.m. and went back on the record at 10:47 a.m.)

CHAIR POWERS: Let's come to back into session. Mike, you're going to do this out here?

MR. MIERNICKI: Yes, I will.

CHAIR POWERS: Okay. I think the floor is yours. Mike, I am told that we have to take a hard break at 12 o'clock.

MR. MIERNICKI: Okay.

CHAIR POWERS: So if you're not done by that time we can lop, it's okay for us to kind of go over in the afternoon but I have to take a hard break at noon.

MR. MIERNICKI: Okay, that's fine. Great, thank you.

Okay, I think we're ready to get started. Good morning, everyone. My name is Mike Miernicki. I'm the Chapter PM for Chapter 3 of the COLA application. That's for the design of structures, components, equipment and systems. And I'm going to provide an overview of Chapter 3, and then we'll move to the tech staff portion of the presentation and go from there. Slide Number 7, I think you have.

Okay, the tech staff review team for Chapter 3 is rather a large and broad area of review so we have a number of technical reviewers that were involved and they represent several technical branches including Engineering Mechanics; Structural Engineering Branch 2; Balance of Plant, Tech Specs; Component Integrity; Radiation Protection and Accident Consequences; Balance

of Plant and Fire Protection; and the Electrical Engineering. And their names are listed on Slides 7 and 8.

CHAIR POWERS: So how did you coordinate all these different branches?

MR. MIERNICKI: With great difficulty. They're actually guided by their SRP sections, their portion of the review, and certainly we crosstalk on crosstalk issues if there's any overlap.

CHAIR POWERS: Suppose I'm trying to do some review on fire protection, and how do I know to go talk to the Component Integrity guy about something?

MR. MIERNICKI: Yes. I guess those type of discussions occur, I like to think with, actually, overlap. That Component Integrity looks throughout the whole application at all the components and structures in their area purview. And there might be an overlap in that the same sort of thing might be asked by the branch for Engineering Components.

So I like to think that there are is, you know, on two levels of protection they ask those type of questions and the tech reviewers certainly talk in the background about things, and then if there's any RAI questions that will be asked in one chapter or the other. So that's what typically occurs.

MEMBER SCHULTZ: Are there any cross reviews done amongst these particular areas that you set up for cross reviews?

MR. MIERNICKI: That's what I was saying. The reviewers are guided by their SRP sections so they would look through the whole application, and then you get an overlap shall I say of someone looks at it from their SRP and those reviewers talk with each other.

And in the SRP there is a lead branch indicated and in some instances, not for all the sections, of another branch listed as reviewers, and there's a table that outlines that.

MEMBER SCHULTZ: Okay, thank you.

MR. MIERNICKI: All right, so that's the branches represented as well as the list of the technical staff people. I think we're up to Slide 10.

So on the next slide there's an overview of the review list on Slide 11. It shows a breakdown of the number of questions asked in each section, and then the column on the right shows the open items that were listed in the P2 SER that you had an opportunity to review. And so that's broken down by subsections.

And if you see there the most, the highest number of questions were asked in 3.8, and 3.8 also has the largest number of open items coming out of Phase

2. Excluding Section 3.7, you can see the total was, we asked 125 questions and we currently have 35 open items that were in the SER.

And I mentioned that 3.8 had the highest number of questions and open items, and that kind of led us directly to having a presentation done by the Structural Engineering Branch on Section 3.8.

Okay, next slide.

CHAIR POWERS: Another way of looking at it of course is that 3.4 only has one question but 100 percent in open items.

MR. MIERNICKI: That's a good point. Yes, and certainly the complexity and whether the question is covered by the SRP or it's rather, you know, a minor question factors into whether the staff determined that the ACRS hears something about it.

MEMBER SKILLMAN: Mike, would it be accurate to assume that the number of questions and open items on 3.8, it is directly based on 3.7 not being yet complete? Are those two related to that event?

MR. MIERNICKI: Certainly there's an intersection in the review, and maybe Sunwoo can speak to that when he does his portion of the presentation. There's some overlap there.

Would you like to answer that now?

MR. PARK: Yes. My name is Sunwoo Park, structure engineer at Division of Engineering. Yes, there are certainly interrelationship within 3.7 and 3.8, and some RAIs have some interrelationship. But so far most of the RAIs that we have issue are rather independent. I mean we have focused on 3.8 issues because the 3.7 is still in progress. So most of the RAIs so far we have focused on issue then, focused on about the 3.8.

MEMBER SKILLMAN: Thank you.

MR. MIERNICKI: Okay, why don't we go to the next slide. That's Slide 12. Okay, the next several slides we identified some of the descriptions, short descriptions, of the open items that we're carrying out of the P2 SER. Some of these have been resolved. You can see a little notation at the end subsequent to the SER being issued.

So on the first slide there we have some questions on Sections 3.2, .4 and .5. And I don't know if the committee has any questions on those open items? If not, we can go to the next slide, Surinder.

MR. ARORA: I already did.

MR. MIERNICKI: Okay.

MR. MIERNICKI: These next several slides, Slides 13 through 17 --

CHAIR POWERS: But you know that we've specifically asked the Applicant, if you would talk to us a little more, say a little more about the waterproofing membrane and its survivability over the projected 60-year lifetime here. So I suspect and we discussed at some length about buried electrical ducts and things like that.

So I mean I'm not sure what you're asking us. Do we have additional questions on these? Yes, we do. Do you have any additional insight?

MR. MIERNICKI: Yes. At this point, what I mean by that is at this point to follow-up on those and ask the staff to respond to some of those things, would be a good time now. But some of the ducting stuff is actually going to be covered by Sunwoo. There's some of his questions, open items are related to that and waterproofing.

MR. PARK: Yes.

MEMBER STETKAR: Can you back up to Slide 12?

MR. MIERNICKI: Sure.

MEMBER STETKAR: The RAI is about the turbine overspeed stuff, RAI 376. I'm not sure. As my reading of these bullets here seems to indicate, I don't know what you're asking for and I don't know

whether you're questioning the analysis that was done or just whether the analysis applies to the valves that will be installed in the plant. My sense is that the latter is more of the notion of these bullets. That you're not actually questioning either the math or the data that were used in the analysis.

MR. MIERNICKI: Right.

MEMBER STETKAR: Is that correct?

MR. MIERNICKI: I don't think we have the technical reviewer to answer that specifically, but that was my take on those questions.

MEMBER STETKAR: That's my reading of these three little bullets.

MR. MIERNICKI: Right. I mean even the expanded read points in that direction.

MEMBER STETKAR: Right, okay. Because if you were listening, my question was more aligned toward I couldn't figure out how they came up with the numbers they came up with.

(Crosstalk)

MR. MIERNICKI: The numbers apply. This is the application.

MEMBER STETKAR: To Valve A or Valve B, okay.

MR. MIERNICKI: Yes, that's what those

questions are generally about.

MEMBER STETKAR: I don't think that they're close to the 1E to the minus 4, depending on what assumptions I make about common cause failures I can get them close to the 1E to the minus 5. Close, not above.

But I was curious about, you know, how much detail you actually looked at, essentially the math. You know, if I were doing a PRA to evaluate the, particularly an overspeed failure, I would have some real questions about the math.

MR. MIERNICKI: Okay, would you like me to get back to you on that one? Because we don't --

MEMBER STETKAR: Well, I mean the Applicant said they were going to get back to us on, essentially what I was asking is some sort of confirmation of how Alstom in particular derived the failure rates that they're using. Because I can't figure that out.

And the confirmation regarding the testing intervals that they applied both for the turbine stop and control valves, which is my understanding they were applying a monthly testing interval for those and a daily, I believe, but it's hard for me to, the words say "daily," but I can't reproduce the number with my interpretation of the daily test for the solenoid

valves. So I believe the Applicant has the take-away on those.

MR. MIERNICKI: Okay.

MEMBER STETKAR: I see nodding in the background. So I don't really have any, I was just trying to probe a little bit with you to make sure that I understood the focus of that RAI, and then I think I have confirmation of that. You're looking at applicability to the actual as-installed valves rather than any of the fundamental --

MR. MIERNICKI: Fundamental --

MEMBER STETKAR: -- the math essentially that was done by Alstom.

MR. MIERNICKI: Correct.

Okay, let's go to the next slide then, 13. These next several slides here, I believe the next five slides, in fact, get into the Section of 3.8 questions for 3.8.4 and Sections 3.8.5. And I don't know if you have any questions on these or not. Why don't I defer those until Sunwoo's presentation. Some of them might be answered there. If not, it might be the appropriate time for those areas. We can do that. Okay. With that let's move to Slide 18 where we have some of the staff's questions on Sections 3.9 that are being carried as open items. Are there any questions there

the committee has? And one question, one additional 3.9 Section on Slide 19, and one open item on 3.11. No questions on those? Okay.

With that I'd like to formally introduce Sunwoo Park. He's already answered one question. He's the lead technical reviewer for Section 3.8. Sunwoo?

MR. PARK: Good morning. My name is, again, Sunwoo Park, structural engineer at the Division of Engineering. I have been involved in the technical review of Section 3.8 for the past several months in which I've taken over the project from my senior colleague who is by now retired from the agency after 39 years of federal service. And I tried to do my best to catch up on the status and the progress made so far and today.

Also we had the excellent support from our contract, the BNL, and Mr. Charlie Hofmayer is joining us on the phone. I think he is sick today. He was supposed to be here, but I heard that he was not feeling well but that he agreed --

CHAIR POWERS: It's just an excuse. He doesn't like us. We've offended him in some way and of course we apologize for that but we'll just have to suffer.

MR. PARK: Okay. So I'm glad that he could

at least join us on the phone. Also he sent a junior colleague, Dr. Xing Wei, who has also been involved in the review for some time.

The Section 3.8 deals with the design of the Category I structures, and it has a five subsections at 3.8.1 through 3.8.5. And the staff noted that in all of the five subsections the Applicant's incorporated by reference the content of the respective subsections of the EPR DCD or FSAR, and also addressed the required COL action items, information items. And I'd like to share with you just a few select topics of interest based on the staff's review.

Section 3.8.4 deals with other Seismic Category I structures, and I'd like to focus on issues relating to design and analysis and procedures and loads. By the way, first three subsections of 3.8.1 through 3.8.3, staff didn't find any particular issues because these sections pretty much incorporate by reference the corresponding DCD subsections.

First, the staff identified that there was insufficient design information presented in the initial FSAR about the site-specific Seismic Category I structure. Particularly there was insufficient information on the site-specific load information to establish the design-basis loads.

And in response to the staff's request for additional information, the Applicant provided in the updated FSAR with design information for ultimate heat sink makeup water intake structure and forebay which are both site-specific Seismic Category I structures. But Applicant has yet to provide comparable design information for buried duct banks, electric duct banks, and the pipes which is an open item.

And also staff determined that the Applicant identified and incorporated all applicable loads site-specific load sources into design-basis loads at the Calvert Cliffs site, including site-specific wind and hydrostatic/hydrodynamic load and the snow and ice and rain. And also this load pressure both the static and the dynamic. Next slide.

The next issue in 3.8.4 I'd like to discuss --

CHAIR POWERS: Let me ask you a question about --

MR. PARK: Yes.

CHAIR POWERS: -- insufficient information. You know, I could always argue that I have insufficient information. So when you say we identified that we had insufficient information, that must be relative to some sort of a standard that you

have. Because I mean I could take the world's most carefully analyzed thing in the world and always say, well, I don't have sufficient information. I mean I can always say that because I never have perfect information on stuff.

So when you make that judgment what do you get, against what standard are you making that judgment?

MR. PARK: Yes, of course we use the Standard Review Plan as the guidance, the guidelines. And when we feel that the information is not enough for the staff to make a safety determination in the particular area being reviewed, we thought the information provided in the FSAR or other COLA documents is insufficient and then we ask to provide more information, to the Applicant.

CHAIR POWERS: So you look at the Standard Review Plan and it says, okay, you need this kind of information. And then you say, okay, I've got all that kind of information called out in the Standard Review Plan, and then you look at some sort of analysis tool or something like that and say, do I have enough to put in as input for that tool or, I'm not sure what the next step is.

MR. PARK: Of course the detail of the review oftentimes require staff to go and use other Reg

Guides or industry codes and standards as a reference, to use them as a criteria for making a safety determination.

CHAIR POWERS: Okay, so it's a combination of the Standard Review Plan and then you look at the applicable regulatory guides if that's what they've invoked, and so I can't, I need a little more information in order to do that, so that if I looked hard enough I could actually find exactly what it is, and presumably I'd specify it in the RAI?

MR. PARK: Yes. And of course the Standard Review Plan is neither a regulation or --

CHAIR POWERS: No, but --

MR. PARK: We are open to the review any alternative approaches that Applicant may propose.

CHAIR POWERS: I'm just trying to understand how you would make these determinations with these. In other words, if I wanted to not approve something I'd just say, well, I need more information. I can always say that, right? Good, thank you.

MR. PARK: All right. Next topic, again, concerns the materials protection issue. Protection from adverse subsurface environment, which has been discussed in detail in all your presentation from UniStar. Also staff's initial review indicated that

there was insufficient data and information, first to establish the adverse subsurface conditions or the aggressiveness of the environment at the Calvert Cliffs site.

And also the staff noted that there was insufficient information about the measures to protect the below-grade concrete structures from these adverse environmental effects, particularly including the effects from brackish water and aggressive groundwater. And also staff noted that there was a lack of technical details on waterproofing system which serves as the centerpiece for these protective measures.

And Applicant in response to the staff's RAI provided the information and the data that are necessary to establish the aggressiveness of the soil and the groundwater conditions at the site in terms of a pH values and the sulfate and chloride concentrations.

And based on what the Applicant provided the groundwater condition, groundwater was considered aggressive based on low pH value and also the denser soils are considered aggressive to concrete. And also the Applicant provided the information describing protective measures and their design including waterproofing system which protects reinforced concrete, and a common basemat from the corrosive

effects of low pH.

And also Applicant provided in his concrete mix design to protect the concrete from the environmental effects of the chloride and sulfate, and also in the RAI's response the replacement, the information about the replacement of adverse soils with non-adverse backfill borrowed from the off-site was provided.

And also the technical details about the waterproofing system including its type and material and also thickness and installation process and so on were provided in the RAI response.

MEMBER SKILLMAN: What is adverse backfill, please, adverse soil?

MR. PARK: The adverse soil, the way I understand it is, due to the presence of adverse or aggressive groundwater and brackish water, and those soil when in direct contact with the structure elements or the increments including pipe or concrete duct bank, is challenging. Those soils that contains the low pH water, the groundwater, and the chloride and the sulfate ions are aggressive to concrete.

MEMBER SKILLMAN: I'm making the distinction here between the adverse groundwater that has the pH and the chlorides and the sulfites, sulfates,

versus the soil itself and determined adverse soil seems to provide a different emphasis on this.

MR. PARK: Okay. Yes, I understand the question. Okay, let me check with Charlie.

Charlie, do you have more information about the soil aggressiveness?

MR. HOFMAYER: Yes, this is Charlie. And sometimes it's hard to hear the question. I can hear Sunwoo's, but the question is, I guess, if you could, the adverse soil groundwater condition.

I think, you know, like the question is really we're talking about the groundwater and whether there are sulfates or chlorides or pH in it. I don't recall the issue of adverse soil.

MEMBER SKILLMAN: Charlie, the term that is used on our Slide 21 is, I quote, "replacement of adverse soils with non-adverse backfill." I understand the concept, but I'm trying to understand how one might take the footprint of the plant that is comprised of adverse soil and replace all of that with non-adverse backfill. That sounds like a Herculean task.

MR. HOFMAYER: Well, I do, and maybe the Applicant can also explain it better, but I do remember having discussions with the Applicant where part of the problem was this adverse environment or the aggressive

environment was somewhat due to a perched aquifer at the site.

And I believe they have, and that's also why, I think, if you look at the other reviews, the water table dropped dramatically also. Because they had or have or plan to remove all of that perched aquifer, the soil associated with that and replace it. And that, you know, I believe, can significantly change the conditions for the site.

Nevertheless, they are monitoring that with this, and then also through this geomembrane system that they sold in the areas where they have the low pH or it's close to being low, they do continue to monitor that. So that's why I believe, you know, what they did was appropriate action.

I can't comment directly on the adverse soil. I don't recall the specifics of that but I think we're talking about removing that perched aquifer which also included the soil that had contained the aggressive environment. So I guess that's why it had the soil/groundwater added to --

MR. PARK: UniStar has some information that --

MR. FINLEY: Yes. Mark Finley again from UniStar, just to confirm. The backfill will be trucked

or barged in from offsite, so we don't intend to use the removed soil as the backfill.

MEMBER SKILLMAN: Then what prevents the groundwater from, if you will, recontaminating or contaminating the replacement backfill?

MR. FINLEY: And this is the reason for the geomembrane. We want to protect against that surficial aquifer, right, so below the water table level, which is 30 feet below the surface at grade, we want to protect against that aquifer which could bring in the aggressive environment, you know, from outside the site.

MEMBER SKILLMAN: I guess I understand the concept and I understood the previous presentation, but I'm seeing this as a subterranean structure surrounded with an impervious HDPE membrane that's supposed to last for 60 years, but that is in a sea of groundwater that has characteristics that may be adverse to the long-term longevity of this plant.

And I'm just imagining how difficult it will be to prevent even your new soil from becoming affected by this sea of groundwater because water will seek its own height.

MR. FINLEY: And that's correct, and that's again why we need the geomembrane to keep out this aggressive environment that the surficial aquifer will

be prevented from contacting the concrete.

MEMBER SKILLMAN: Thank you.

MEMBER STETKAR: You're essentially admitting that the, you know, the soil's going to be saturated with whatever that groundwater is.

MR. FINLEY: That's correct.

MEMBER STETKAR: It's just you're removing any previously contaminated soil by your excavation program.

MR. FINLEY: That's correct.

MEMBER SKILLMAN: All you're doing is you're counting on that membrane to repel this for 60 years.

MR. FINLEY: Yes, with an appropriate monitoring and dewatering program if necessary.

MEMBER SKILLMAN: Thank you.

MR. WEI: I want to ask something. So my name is Xing Wei. I'm from Brookhaven National Lab. My understanding of your question is what's bad about the water, groundwater, and also what is bad of the soil.

MEMBER SKILLMAN: Well, in this particular sentence it is the removal, the replacement of the adverse soil. So my first understanding of this phrase is this massive excavation, the partitioning of soil so the bad soil is in another place, and the replacement

of backfill that is non-adverse.

And I understand the protection of the new backfill with the membrane, but I'm saying to myself, how are they going to do that? I understood the previous presentation about the membrane, but I'm thinking in terms of, I guess, square acres not square feet or square inches. And I'm thinking this is a massive undertaking to protect that site underground for 60 years. And other people have had challenges doing this, so this sounds like a massive challenge.

MR. TYNAN: Yes, this is John Tynan from UniStar, and you're correct. If you actually look at the amount of backfill we need it is a massive undertaking.

But, you know, on a construction plane with that goal, our intent is to essentially bring the site down to the level required to set the NI, and then sequence up. Build up with backfill across the entire powerblock structure, simply because from a placement and a shear wave it was very difficult like for us not to encompass, right, and we have fairly compact design here, not to encompass the entire footprint of the powerblock with structural backfill. So if you actually look at our plan, we dig it all out, we then start to build. We build up sequentially. We

build up with backfill. So it is a massive, massive excavation. I would agree with you.

CHAIR POWERS: Sounds like Vogtle.

MR. TYNAN: Vogtle plus one.

MEMBER SKILLMAN: I've made my point and I got it. I thank you --

MR. TYNAN: You're welcome.

MEMBER SKILLMAN: -- for your very clear explanation, both of you. Thank you. And yours too, thank you.

MR. PARK: Next. The next topic is related to the testing and in-service surveillance programs. The initial review indicated that there was insufficient information again on testing and in-service inspection program for Category I structures subjected to adverse subsurface environment. That has been discussed in the previous slide and also in the morning.

And the staff reviewed it and they found that the information, the needed information on the testing and in-service inspection was expanded or they supplemented in the later FSAR version. And they included for below-grade concrete beneath aggressive low pH groundwater table, the Applicant specified that water collected by the waterproofing geomembrane system

will be monitored.

And also the groundwater table in the powerblock area will be monitored periodically. The buried concrete duct banks and the exposed, banks exposed to a low pH groundwater will be inspected periodically. And in-service inspection program for buried pipes will be supplemented with a periodic in-service testing in accordance with the ASME standards, Section XI.

MEMBER STETKAR: Sunwoo, the question asked the Applicant regarding inspections of their buried pipe, and this is buried, not underground pipe so it's in contact with the soil, from their makeup water facility, in particular, since that's the site-specific facility that we're discussing here, how does the staff, you mentioned ASME codes and things like that.

How does the staff take into consideration the GALL report NUREG 1801, you know, which specifies a buried pipe inspection program for, in particular for license renewal but, you know, if I were going to build a plant for 60 years we have experience that shows that some types of buried piping and some types of environment degrade much earlier than 40 years, much less 60 years.

So I view this inspection program as a buried pipe inspection program not something that I

invoke at, you know, T equals 40 minus ten years, which is the way the GALL report is written. How does the staff consider that in the questions you've asked the Applicant about, in particular, inspections of the buried piping, or do you? And if you don't, why not?

(Off microphone comments)

MEMBER SKILLMAN: I was waiting.

MR. THOMAS: Brian Thomas, branch chief of the Structural Engineering Branch. In the licensing review I will admit the staff does not consider the details of the GALL report with respect to its questions about what's in the inspection program.

In this instance, the staff was particularly looking for, you know, what program, if any, you have to address the buried pipe. What's the design of the buried pipe, you know, what's the environment, et cetera and so forth.

GALL report, we'll have to take that back and go and look at it. The GALL report does look at more detail at the maintenance capability of the Applicant. It looks at, of course, the life of that buried pipe, which is a legitimate concern.

Yes, a primary concern here is design and programs from a monitor trend standpoint that you have in place that would assure the integrity of the pipe

and the continued performance of the pipe. But that's a very good linkage you've brought to light here. And we'll take that back and get back to you.

MEMBER STETKAR: Thanks, that helps. You know, I'm not going to make any -- but I asked the Applicant what kind of material it is and I, you know, I have little pictures here. So I'm not going to make judgments, so just curious. You've answered my question about how does the staff consider those, so thank you.

MR. THOMAS: All right.

MR. PARK: Okay, next slide. Subsection 3.8.5 deals with foundations. And we identified that some issues in relating to stability analysis specifically staff identified that there is insufficient information provided in the FSAR concerning sliding stability analysis. More specifically potential sliding interfaces were not fully identified and described.

And also there was insufficient information on the values and determination or verification of friction coefficients for different interfaces.

Now in response to staff's RAI, the Applicant provided all potential sliding interfaces and also corresponding friction coefficients. The sliding

interfaces consist of different material surfaces including soil, concrete, mudmat, and waterproofing membrane. And here soil included natural soil and structure backfill as well.

Also Applicant specified a vendor testing programs to verify coefficient of friction for waterproofing membrane prior to construction, prior to the installation, and also established corresponding ITAAC commitments.

And staff find that the Applicant has yet to provide detailed information on sliding analysis for each Seismic Category I structure. They promised to provide that, but they still, they remain an open item. Next one, please.

MEMBER SCHULTZ: And just a point of clarification on the second to the last bullet where the vendor testing program has been specified and the program has been reviewed now by the staff and found to be acceptable, or is there still ongoing review about the program that's been proposed?

MR. PARK: Okay, Charlie or Xing, any details?

MR. HOFMAYER: I don't think they ever specifically described the vendor testing program. There is an ITAAC that ties the fact that this will be

performed and it will be verified that the coefficient friction that they've assumed in the analysis they have shown by vendor testing that that is appropriate. But that specific vendor testing program, I don't recall it being specifically described as being handled by ITAAC.

MR. PARK: Another issue related to this is sliding stability coefficient value, friction of a coefficient. Initially I understand that the EPR used a 0.7 as the referenced coefficient of friction and later on changed it to 0.5, I believe, in order to accommodate the Calvert Cliff situation.

So initially that constituted a departure, Tier 2 departure, but because of that change in DCD that departure has been lifted. And that response, we received the response quite recently and that is under review.

MEMBER SKILLMAN: So in this case the Design Certification changed. UniStar stayed with their 0.5, is that correct?

MR. PARK: Yes, and before the, when coefficient of friction was set at 0.7 in DCD and Calvert Cliff could not beat that value, it was lower than 0.7, so in terms of a sliding it's not safe. Now the DCD standard, the value, it's lowered to 0.5 and the

Applicant --

MEMBER SKILLMAN: No longer needs a departure.

MR. PARK: Yes, that says it. There's no longer departure.

MEMBER SKILLMAN: Now I understand, thank you.

MR. PARK: But also that the brief review indicated that there's a natural soil and structure backfill interface, and the natural soil has a coefficient of friction slightly lower than 0.5, so this may be a little issue, may not be significant but the staff needs to review that.

MEMBER SCHULTZ: And this commitment still stands with regard to the testing?

MR. PARK: Yes, the ITAAC commitment. Yes.

MEMBER SKILLMAN: Thank you.

MR. PARK: Another issue in 3.8.5 is the concerns with the differential settlement, which is rather important issue from a structural entity point of view. And also this area, this settlement issue is under the joint review of the Structural Engineering Branch and the Seismic and Geotechnical Engineering Branch.

And we tried to focus on the structural engineering aspect of a settlement issue and the differential settlement. Since they potentially affect or alter the design-basis load, we particularly tracked this issue with care.

The initial staff review indicated that there was insufficient information again on assessment of the impact of differential settlements on the design-basis loads. Particularly, inadequate information was identified on developing site-specific settlement profiles utilizing site-specific soil conditions and actual construction sequence and their reconciliation with EPR settlement profiles to determine whether the COL, the differential settlement profiles will be enveloped by the EPR, corresponding EPR, the profiles.

The staff's evaluation indicated that these area still remain open, these issues remain open, particularly in FSAR. The FSAR need to be updated to include the adequate information on site-specific settlement assessment for all Seismic Category I structures, and their reconciliation with the EPR, they reference the settlement profile.

And Applicant will have to clarify how the site-specific subsurface conditions are taken into

consideration in analysis, particularly the effect of a lateral variation of soil properties within each subsurface strata.

And also Applicant will have to ascertain or demonstrate that the proposed settlement monitoring program is appropriate and capable of providing differential settlement contours comparable to those of EPR. For example, the number of settlement probes specify they should be enough, should be large enough to generate the contours with a sufficient resolution to be able to compare with the established EPR contours.

This is pretty much what I had in mind to share with you this morning.

MR. MIERNICKI: Any other questions for Sunwoo? That concludes the staff's presentation on Chapter 3.

CHAIR POWERS: We have discussed at some point, with both you and with the Applicant, on this aggressive groundwater has low pH, some amount of chloride and some amount of sulfate in it. With respect to concrete, there is lots of concrete on the site. Do we have a good understanding of how aggressive this material is toward concrete structures?

MR. PARK: The pH value that Applicant reported was lower than the value presented in the SRP

acceptance criteria, so that's how they declared that the groundwater in the powerblock area is aggressive in terms of a pH value.

CHAIR POWERS: I guess what I'm really trying to understand is Applicant is proposing a very heroic effort, and more power to him, and I'm going to love to see the hole when they dig it. I missed Vogtle's hole, so I want to see --

(Crosstalk)

CHAIR POWERS: But I'm sure this, I mean we've got two other power plants on this site and so there's lots of concrete, and is it all falling apart because of aggressive attack from this wonderful groundwater?

MR. PARK: The primary concern from a structural engineering point of view is the corrosion of reinforcements in reinforced concrete basemat. So that's why whether putting a membrane was considered as a measure to protect reinforced concrete basemat, and that also the, so permeability is an issue to try to lower the permeability of concrete, of the Applicant's proposed to use a lower water-to-cementitious material ratio and also the replacement of cementitious material, certain portion of cementitious material with flyash again to lower the

permeability so that water can penetrate into the concrete less.

CHAIR POWERS: What strikes me as of interest is you have a couple of, two or three strategies here to try to mitigate the attack. We've got engineered backfill. We've got a impermeable membrane. You've got superior concrete.

None of these carry with them a guarantee that they will stop, absolutely, the attack by the water on the concrete. They're a bunch of barriers that will slow it down a bit. What I'm trying to understand is, okay, suppose all these things fail, how badly is my concrete then going to be attacked? And I should say I worry a little bit more about the reinforcements more than I do the concrete but it is, in fact, the sulfates that will spall the concrete and still attack the rebar.

How fast is that or is there an inherent protection provided by the concrete in it just to slow the process?

MR. PARK: You mean how fast or the rate of a protection?

CHAIR POWERS: Sure.

MR. PARK: Charlie, do you have anything to comment on Dr. Powers' question?

MR. HOFMAYER: I'm sorry. It's very hard to hear the question. I can hear Sunwoo, but the question related to the concrete, the durable concrete?

CHAIR POWERS: What I'm asking is, what do know from a database point of view about the rate of the attack on concrete structures by this amazing groundwater?

MR. PARK: The rate of attack of concrete particularly including reinforcing bar due to this groundwater, aggressive groundwater effect. So how long, in other words, I guess, the concrete can remain intact and what is the time frame of the corrosion, the process? I think that was part of the question.

MR. HOFMAYER: The process is slow. And of course the Applicant's line of attack for this is to provide durable concrete or as Sunwoo explained low water to cement ratio. Then on top of that they have a waterproofing membrane or this double waterproofing membrane that they basically had put in the area that they consider aggressive to prevent any attack.

And they are then monitoring the groundwater in that area that might be collected in the geomembrane system, and therefore they would have a monitoring program that would identify whether this groundwater is indeed aggressive and then could take

appropriate actions if they were identifying that they had conditions that were more adverse than they expected.

The process is slow. I would be reluctant to say how long if you were subjected to, which I think the question is, you say, how long if you were subjected to the aggressive groundwater would it take to affect the rebar?

So it's hard to put a time frame on that, but nevertheless the Applicant has many alternatives. In this case, you know, he's taking appropriate action to make sure that he's seeing that those conditions don't exist.

MR. PARK: So I guess the long-term performance of a geomembrane waterproofing system is a key to protection of the NI basemat. We are talking about 40 to 60 years of a lifespan, and the long-term durability issue was pointed out earlier. So the staff will check that issue, the long-term performance, the durability issue of a geomembrane. The staff will continue to review that area.

Charlie or Xing, do you have any other issues or concerns that you want to raise before we close the section?

MR. HOFMAYER: You are asking me? No.

MR. PARK: All right. Thank you, Charlie.

MR. FINLEY: If I could add just one point, Dr. Powers, to your question. I can't completely answer your question about rate of attack on concrete, but in terms of measured pH at the Calvert Cliffs 3 site, we've measured conservatively 5.2 as our surficial aquifer pH, and I believe the definition in the SRP regarding aggressive is 5.5 and below. So I would characterize it as marginal, but I can't answer the question of what the rate of attack might be.

CHAIR POWERS: I mean you can see how it impacts one's thinking is that you're going to put in this individual barrier on it, and then we're going to interrogate the hell out of you on how good is that barrier that you put in this field. And you're going to put in the wells and then you'll say how quickly do they have to be responsive.

But if your concrete will stand up to 40 years without all this stuff then I become less concerned about this sort of thing. You know, I'd say, okay, you've got a few barriers here. If any one of them fails the other ones compensate, and I don't have to have people instantly watching carefully the little pH meter day and night and things like that. I mean it's just a difference of interests here.

I mean 5.2 is roughly soda pop or something

like that. So I mean it's not like it's going to corrode through the steel and then instant right in front of your very eyes in a smoking cloud or something like that.

Okay, any other questions on this? This is going to be our last chance to discuss Chapter 3 for at least an hour and a half.

MEMBER SKILLMAN: We're going to take 3.7, I suspect.

CHAIR POWERS: Well, we'll see 3.7 on an eventual date, okay. No mistake, you've got to come back this afternoon. And we're going to nominally be discussing Chapter 14.

But if you have a question on 3, I'm sure that Arora would be delighted to provide you an in-depth and detailed answer on any aspect of it except for 3.7. So only for the next hour and a half must you hold your peace.

Okay, if there are no additional questions for the speakers, then I will put us in recess, and I have to go to 1:15 because --

MEMBER STETKAR: You don't have to.

CHAIR POWERS: We have to because somebody on the schedule will have scheduled his travel to arrive here at 1:13, so we can specifically listen to Mr. Finley talk about Chapter 14 and would not want to miss a single

word of pearly retort.

MR. FINLEY: I'm sorry I cut into everyone's lunch break.

CHAIR POWERS: So we're recessed until 1:15.

(Whereupon, the foregoing matter went off the record at 11:51 a.m. and went back on the record at 1:14 p.m.)

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

(1:14 p.m.)

CHAIR POWERS: Let's come back into session. We were going to have a presentation of an answer on a turbine missile but I guess we're not going to have that. So Mark, you had something that you wanted to say about ducts?

MR. FINLEY: Yes, sir. So good afternoon. Just before the session I passed around a section of the duct banks, and we'd like to speak to the question related to drainage, and if there's other questions we can try to answer it. I'm going to ask Shankar from Bechtel to speak to the diagram here.

MR. RAO: Hi, this is Shankar. If everybody who has a copy of this can refer to the duct bank cross-section here. If you see these duct banks are provided at the raceways for cables, and the raceways are PVC sleeves in the duct bank, embedded in the duct bank.

And once the cable is pulled they provide, each sleeve is provided with a water stop so that there is no water intrusion from duct bank, one side of the duct bank to the other. These duct banks are in certain length sections, and each are then terminate at the building or on the manholes in between so that you --

MEMBER STETKAR: So you do have terminations for access at manholes?

MR. RAO: Correct, and therefore, and these manholes are sealed at the top of the surface. However, water can penetrate and go inside the manhole. That's why this bottom vent pipe is provided, to drain any water that intrudes into the manhole and then eventually is going into, our case --

MEMBER STETKAR: This drawing shows that drain as if it's embedded in the concrete. Is that true?

MR. RAO: Yes, it's a piece of --

MEMBER STETKAR: It's a piece of pipe in the concrete.

MR. RAO: In the concrete as part of the drain. While these sections are made we can --

MEMBER STETKAR: Okay, so at a manhole though you'll have a collection point that drains into this --

MR. RAO: Right. Particularly, a manhole may have a sump, with a sump pump or --

MEMBER STETKAR: That's what I was going to ask you. Do you have positive flow out through this with a sump pump?

MR. RAO: Yes. Depending on how this thing is routed it could even have like a channel back to next --

MEMBER STETKAR: Yes, I've seen those, but

you do have some sort of positive removal process?

MR. RAO: Right.

MEMBER STETKAR: You don't rely strictly on gravity drain through the whole length? I'm concerned mostly gravity drain through the whole length of the entire span there, however far that was, a half mile or so.

MR. RAO: If manholes are at the low points then we do have a separate water removal that's sump collected or periodically go check and actually remove the water with a temporary means rather than having a full-blown sump pump installation.

MEMBER SKILLMAN: May I ask you to explain the legend? I understand eight feet by eight feet. It appears that this is eight feet high and eight feet wide with 36 holes. I don't understand the 3'2" and the 3'2" for the A, and the 2'5" and the 3'2" for the B. Could you explain that please? It's at the legend.

MR. RAO: I have to double check that. It could be the space in between the conduit.

MEMBER STETKAR: That would be extensive.

(Crosstalk)

MEMBER SKILLMAN: I'd just like to understand the legend, thank you.

MR. RAO: Sure.

MEMBER STETKAR: Thanks. That clarifies. And most important to me is that in the manholes, and the concern you have is manholes filling up with water and not either monitoring them or having a positive way of draining them.

And with no positive way of draining them you also worry possibly about water backing up through these drain, you know, theoretically the water is supposed to go out through the drains, occasionally it doesn't. In fact, it can come back.

So the ability to positively, the tech water accumulation in the manholes where the real concerns are. I'm not concerned about water in continuous spans. Helps an awful lot. Thanks.

MR. FINLEY: Okay, good. Thank you, Shankar. Okay, so good afternoon. We're talking about Chapter 14 this afternoon. And I hope the, I know at least the level of presentation on our side is maybe not quite as comprehensive as what we had this morning, so hopefully it won't take quite as long.

So Chapter 14 is Verification Programs, and Page 2. We're going to use the same process. We had used, since we incorporate by reference, generic information from the Design Certification. We're only going to focus on the site-specific information or

supplemental information that we've put in our FSAR.

And back on February 23rd, 2012, was when the committee considered the AREVA presentation on Chapter 14. Slide 3. So at a very high level we have no departures and no exemptions on Chapter 14. There are no ASLB contentions.

We do have 16 COL information items. Some of those are ongoing in terms of open items that haven't been fully resolved with the staff. As we said this morning though, with all the open items we feel we have a good, clear vision to the closure path for all of the open items.

Slide 4, by way of introduction I think you all know myself. Let me introduce my support for Chapter 14 here. We have John Volkoff who's our licensing engineer specifically focusing on the ITAAC area, and Mark Hunter who's our operations and maintenance director for UniStar. So they'll help me through this process.

So we move to Slide 5, just a quick summary. Three sections in Chapter 14. Specific information addressed for initial test program. 14.2 is the initial test program itself, and 14.3 is the ITAAC program in process, and then I'll have a few conclusions at the end.

But Slide 6 is Section 14.1 and, in fact, here we have really no additional information that we've provided, and I think the DC section is all of two pages long, so it's pretty high level requirements for an initial test program and we have nothing to add to that.

So move quickly to 14.2 and on Slide 8. So the first topic speaks to the startup organization we'll have on site, and there's three main pieces to the startup organization. One is a corporate piece which is UniStar Nuclear Energy Startup Organization.

One is, I would say, a construction piece which would be as we envision it now, a consortium forum between AREVA and Bechtel that's called the Project Delivery Organization. I'll speak a little bit more about that in a second.

And then one a site organization which is the UniStar Nuclear Operating Services. The site and the plant organization will be within that organization. The corporate startup organization will be led by a vice president, and the site organization or the UniStar Nuclear Operating Services Organization will be led by a site commissioning manager.

And then within the corporate organization we'll have a manager of commissioning integration. That manager of commissioning integration will report

directly to the vice president that I mentioned. And overall, the UniStar startup testing and commissioning organization will have an oversight role for this initial startup and testing program with the primary responsibility for developing, managing and executing the initial test program being with the project delivery consortium.

So the AREVA/Bechtel folks that will be writing the procedures, essentially, and conducting the tests UniStar will oversee that organization. And certainly for any operation of plant equipment that requires a licensed operator to manipulate the equipment, the UniStar organization will be doing that.

The UniStar site organization will also be a member of the test review team, and I'll talk a little bit more about that in terms of what that team does.

CHAIR POWERS: Why this organization and not some other?

MR. FINLEY: I think we modeled this organization after other utilities and experience that we've had and experience from discussing with other construction vendors. This has been part of the basis for our contract negotiations, if you will, for engineering construction procurement, so we've assigned responsibilities accordingly.

CHAIR POWERS: What's wrong with it?

MR. FINLEY: I'm sorry?

CHAIR POWERS: What's its vulnerability?

MR. FINLEY: So obviously one vulnerability is the complexity of it. You have three really different entities. So integration, clearer responsibilities and accountability would be critical.

CHAIR POWERS: We've lost crucial manpower.

MR. FINLEY: Right, right.

CHAIR POWERS: I mean key player.

MR. FINLEY: Exactly. Exactly, yes. So yes, we'll have a training program and, of course, a staffing program to assure that we have the right people in the right places. I think, you know, communication is the key between an organization like this, and you've got commercial responsibilities that go back to the contract as well that you have to make sure are enforced.

MEMBER SKILLMAN: Have you used this manager of commissioning integration anywhere else?

MR. FINLEY: Not to date, no. This organization obviously at this point is not fully staffed. Our intention is, in the FSAR as we have it now we describe the organization and how we intend to staff it, but at this point we don't have these positions

staffed.

MEMBER SKILLMAN: Have you seen this position function successfully anywhere else?

MR. FINLEY: I can't say that I have personally. I'll ask Mark. Any personal experience?

MR. HUNTER: No.

MR. FINLEY: No. With respect to the manager of commissioning, I think that's sort of the overall responsible individual for the site and, you know, the one individual that's responsible for oversight of the construction teams, implementation of the test program.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: So Slide 9, we talk a little bit about turnover of systems from construction to the startup organization. We will have administrative procedures that formally describe how this turnover process will occur, but it will contain the following elements.

As we describe here, we'll have a clear boundary designated for which components are to be turned over. We'll review the construction activities within that boundary and make sure the construction activities are completed. We'll require formal acceptance and formal turnover to the site commissioning manager.

And then we'll establish controls to prevent construction from going back into that boundary and affecting any of the components that have been turned over. So those are the elements of the turnover process.

Slide 10. A little bit about how we intend to prepare test procedures. We'll talk about that over the next couple of slides, but obviously we'll take references, first, in terms of input from the appropriate design and vendor organizations.

Obviously the FSAR, both the Design Certification and the Calvert FSAR, any appropriate technical specifications, and any appropriate regulatory guides. That will be the input in terms of what we require in the procedure, what will take data, which is we have the data basically grouped into three parts.

The first part is the ancillary data, and this is data taken during the procedure that really is not taken for either review or acceptance criteria that I'll talk about on the next slide, but more just background data that could be useful in the future. So some examples of that type of data are given there on the bottom of Slide 10.

Slide 11. We will establish review criteria and acceptance criteria. The review criteria

will really be based on the expected performance, not necessarily the required safety performance, but based on the expected performance based on vendor information, procurement type information. That should be more conservative or more restrictive than the acceptance criteria which is essentially based on the safety analysis.

So we would have to meet review criteria. We would do some evaluation if the review criteria is not met. Ultimately we have to meet the acceptance criteria, finally. Slide 12.

CHAIR POWERS: Your use of the word "conservative" here, I think that's a peculiar way to use it. Conservative has a problem as a word. Conservative with respect of what, and it's conservative with respect to what here too, I think.

MR. FINLEY: Maybe say it another way. If we meet the review criteria we will be assured to have met the acceptance criteria.

CHAIR POWERS: The safety analysis may assume that a gallon per minute comes out of a pump, and the performance expectation may be 25 gallons per minute.

MR. FINLEY: Right.

CHAIR POWERS: And if you meet that one then

you're assured to meet the safety analysis.

MR. FINLEY: That's right. That's right.

CHAIR POWERS: That's one of the reasons you just hate the word "conservative," because you've got to know relative to what and for what purposes. And what's conservative in one context is non-conservative in a different context.

MR. FINLEY: Okay, on Slide 12, just a pretty high level in terms of conduct of the test program. The initial test program will be planned and conducted prior to the startup test group, which is essentially the organization I described previously. No additional details there.

On Slide 13, I'd like to talk a little bit about the test review team and what their makeup is and then what their functions are. So the test review team is a critical body which would pull together all of the key parts of the organization, those three pieces that I mentioned. So the site commissioning manager will be the chairman, and as I said, really, the single individual responsible for oversight and conduct of this startup program.

The project delivery consortium representative and then a representative from the site from the engineering department, operating department,

and then perhaps other technical experts as needed to augment the membership. And then for low power physics testing piece we would add the plant general manager to that group.

Slide 14, just to review some of the functions of this test review team, I'm not going to go point by point there, but basically they will review, provide the final review, I should say, of the procedures that are written and developed.

This group will review results, and of course if there's some unacceptable results they would take appropriate action or ensure that appropriate action was taken in response to any results that don't meet appropriate criteria. And then in the end they would be the body that would make the formal recommendation to proceed, to continue on the next phases of the startup.

CHAIR POWERS: One hopes, and certainly plans the designs of these and when the tests come out with a black or white result, not all tests do that. A lot of tests come out with a, it looks black to everybody on the committee except for those people that say it looks black. How do you decide those questions?

MR. FINLEY: So a difficult question. In fact, we haven't developed the detailed procedures for this test review team and how they operate, but what

we're familiar with is we generally work toward a consensus, a unanimous consensus on the test result and position. But following that you would have some kind of voting process of the members, and then the chairman of this group would make a final decision based on that.

CHAIR POWERS: Okay, So it's, the chairman is the guy that makes the decision and he takes the advice of the members of this team, but he makes the decision.

MR. FINLEY: That's correct, yes.

CHAIR POWERS: Is that consistent with the corporate culture?

MR. FINLEY: It's consistent with the culture that I'm familiar with, yes.

CHAIR POWERS: There's no right answer to this, it's just how you operate. And you tend to operate in one basis and you can take a majority vote or you can have the guy responsible make a decision. I mean --

MR. FINLEY: Right.

CHAIR POWERS: -- it's first consistent with your culture.

MR. FINLEY: It's consistent with the accountability that we intend to set up via the site commissioning manager.

CHAIR POWERS: Okay.

MR. FINLEY: So I think I'm on Slide 15.

CHAIR POWERS: So if I come to your site and I see these bodies hanging from poles, those are former members of the committee that had determined and screwed up or something like that.

(Crosstalk)

MR. HUNTER: The guy that gets that position has to be tough enough not to be hung.

CHAIR POWERS: Oh, I see.

MR. FINLEY: Slide 15, a little bit more about test results. These will be reviewed first by supervision within the startup organization, likely within the consortium construction group, first, prior to being presented to the review team.

And then obviously these results will be compared to specific acceptance criteria, and if there is any failure with respect to the acceptance criteria there would be an evaluation by Engineering that would be required. And this would also be submitted to the test review team, and then a final determination would be made.

And as I said before, there would be some corrective actions required, either actions to fix the system or actions that would change the acceptance

criteria before final acceptance of any failed results.

Slide 16. I think this is consistent with what's described in the Design Certification, but we anticipate four phases to the initial test program. A pre-operational phase, initial fuel loading and pre-criticality testing, then initial criticality and low-power physics testing, and finally the power ascension testing with those plateaus as you see there.

And the TRT would be involved in movement from phase to phase, and then in the power ascension phase be involved in movement from plateau to plateau in terms of verifying that the plant overall is ready to move to the next phase or the next plateau.

CHAIR POWERS: If you go to five percent and you find something, or let's say you go to 25 percent and you find something that's amiss, correctable, you correct it, do you return to 25 percent or do you go back to five percent?

MR. FINLEY: Well, I think it's hard to answer that in a general term. Certainly the primary focus of the test organization would be to keep the plant in a safe condition.

So if there's any information that's uncovered at a certain power level that's out of what was expected or exceeding some criteria, that would be

immediately evaluated and if felt by the team how it would be reduced to confirm or in a safe position.

One of the things, and I think I talk about it on the next slide, that this group would do is to trend the trend data from throughout the startup and ascension and make a prediction so that you don't find yourself in that position that you suggest.

You want to make sure your trending shows the data still within proper bounds at the next plateau so you're not surprised by a condition that's out of spec. I can't say in all cases we would reduce power, but I think you would quickly evaluate the condition and certainly if there is a safety issue there you would reduce power back to a sure, safe condition.

Slide 17. The administrative procedures for review and approval of test results. I think I've spoken to this some already, but we will compare measured plant parameters against the predicted parameters.

As I said before, if any limits could be exceeded prior to reaching the next plateau then the testing would be suspended before proceeding to that power level. And we have appropriate corrective actions that would be implemented.

Some examples of the limits that we would monitor include the radiation safety limits, liquid and

gaseous effluents, offsite releases, grid stability. And then finally, when we reach 100 percent power the final test results would be reviewed, evaluated, approved and, I believe, we submit a test report to the NRC staff.

MEMBER SCHULTZ: Mark, the administrative limits that you have in the first bullet there, are those the ones that could tie back to the safety analysis assumptions that I presume would have been documented in the test program? Not all the limits in the safety analysis are necessarily what you might call regulatory, but they have to be found somewhere.

MR. FINLEY: Right. I think in this context administrative does mean, I would say, site-specific limits, but they could be the acceptance limits that we talked about previously but just not explicit in regulations.

MEMBER SCHULTZ: Understand.

MR. FINLEY: So there are administrative limits in the sense there are limits at the site, but they're important safety limits nonetheless.

MEMBER SCHULTZ: Thank you.

MR. FINLEY: Slide 18. In terms of the test program schedule there are some specific elements that are talked about in the Design Certification and

we'll have those elements addressed by our schedule. We'll make sure that we provide adequate time to essentially review results from a previous phase before proceeding to the next phase.

We'll make sure that we don't let untested structures systems or components affect the plant during the testing process. We'll make sure that the test procedures have adequate time for review both by the start up organization and also the NRC review staff, and that there is adequate time to complete the ITAACs prior to fuel load as required.

MEMBER SKILLMAN: Mark, you have not commented on the accountability that UniStar will have for this program to 10 CFR 50, Appendix B, and you have not commented on documentation and recordkeeping. I'd like to hear a little bit about that please.

MR. FINLEY: Okay, certainly. So with respect to 10 CFR Appendix B, certainly this UniStar startup organization would have overall responsibility for meeting Appendix B. In other words, we would have quality programs that relate to procedures and procedure writing, training of the staff and training of the operators, et cetera, in accordance with our Appendix B program.

In addition, the contracts that we would

have in place for the consortium that I mentioned, this project delivery consortium, would be safety-related contracts with respect to work on and testing of safety-related components.

So through a contractual mechanism we would enforce 10 CFR 50, Appendix B requirements to the project delivery consortium. Ultimate responsibility lies with the licensee of course, but contractually we would assure that the consortium that supports this process would also implement elements of the quality program that are required.

MEMBER SKILLMAN: Okay, two pieces. Would it be accurate to assume that you are going to have a strong, corrective action program criteria in XVI-16 running ahead of this so that you capture your items?

MR. FINLEY: Certainly. We would have to have a strong corrective action throughout, throughout the construction process, and one of the key elements of progressing through the phases would be a review of that corrective action program and what deficiencies do we have in the plant, and correcting those that are necessary prior to continuing.

MEMBER SKILLMAN: Okay, and one more of the old often lost but not forgotten is Criterion (iii)(3), Design Control. And it presents itself consistently

when you're trying to start up and you begin to make modifications to fix the whatever it is that didn't let you proceed.

So talk a little bit about how you're going to make sure that you capture what you changed to make it successful. That you haven't injured the design that you just spent millions of dollars building.

MR. FINLEY: Yes, so not easy to do in 25 words or less. So with respect to design function, at this stage of the project we would expect that the project delivery consortium, the construction consortium would retain the design control function. So with respect to fixing deficiencies or implementing any modification, whether it be to fix a deficiency or not, it would be the design control process of that consortium that we would hold accountable, if you will, to assuring that changes to the design don't have any unintended consequences.

So as you know when you make changes your design control program needs to assure that those changes are made consistent with your overall design control process. And again we would intend to do that contractually through the consortium.

So the same people that are doing construction, which would be the consortium, are also

doing the design to support that construction. So in terms of hand-offs we think that would simplify the process.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Okay, I think I'm on Slide 19. So we have individual test descriptions in our FSAR which would supplement the individual descriptions in the Design Certification. We have the same format and the same basic content.

Our test descriptions cover site-specific systems, whether they're safety related or non-safety related, but essentially all of the important site-specific systems have test descriptions that we've developed and they include the objectives, the prerequisites, the test method, data required and some verbal description of acceptance criteria. So we have that level of description of the testing process now in the FSAR.

Specifically there's been some question with respect to the natural circulation test. This is on Slide 20. This is a test that's actually described in the Design Certification FSAR. So at this point we've committed to either performing this test or providing the appropriate justification for not performing the test. In other words, taking some credit for natural

circulation tests done at similar facilities.

In our planned construction sequence now, of course, we would come after the plants that are being built now in Finland and France and China, so at least as it stands now, I think the review process is not complete on this but we're leaving ourselves the option to evaluate those test results in the other facilities to determine whether or not we need to do a natural circulation test here. So I think this is still an open item with respect to the staff review.

CHAIR POWERS: It does raise the question though, my perception which may be erroneous, but my perception is that the Fins have set up a very extensive pre-operational test program. And with respect to those things that are site-specific do you know how your test program compares to those?

MR. FINLEY: I don't. I do agree. I've heard that they do have an extensive test program as does EDF at Flamanville. I can't compare any specifics of our, of course our program is not developed to the level of detail that they have. It's a little hard to compare. But they obviously also intend to perform a natural circulation on tests with respect to this test at this point.

Yes?

CHAIR POWERS: It is just my perception and I don't have anything specific, but they have a super overkill in their pre-operational test program.

MR. FINLEY: Certainly in terms of the NSSS right now, you know, the reactor coolant system and the steam generators are virtually identical. Very, very little dimensional differences. I think the fuel assemblies could be slightly different depending on which project you're talking about, but at least at this point we don't see why you couldn't apply data taken at one of those earlier sites to our site.

CHAIR POWERS: Coriolis forces. Actually, I'm not kidding. Unfortunately, Dr. Corradini is not here to appreciate the joke.

MEMBER STETKAR: What's the latitude of Calvert Cliffs compared to Flamanville?

CHAIR POWERS: I would assume that Calvert Cliffs is substantially south.

MEMBER STETKAR: South.

(Crosstalk)

MR. FINLEY: I think we are north of Tai Shan though, so --

(Laughter)

MR. FINLEY: Okay, I've written that down, Dr. Powers, so we'll take Coriolis.

(Laughter)

MEMBER SCHULTZ: Is there a plan right now for UniStar involvement or at least observation associated with this startup testing in the facilities?

MR. FINLEY: Yes, there is. Certainly with the EDF startup testing commissioning program at Flamanville we will be involved with that and get communication with that. We haven't had any direct communication with the TVO or spoke in terms of attending startup at the Finnish site, but through AREVA, you know, who's a part of that commissioning process at the Finnish site we will get the lessons learned from that startup program.

MEMBER SCHULTZ: Thank you.

MR. FINLEY: Okay, and if I can move to, I think on Slide 21. Yes, Slide 21. So this has to do with --

CHAIR POWERS: Can we come back to this natural circulation, please?

MR. FINLEY: Sure.

CHAIR POWERS: I understand better, but I mean why would you not want to do this test?

MR. FINLEY: Other than it's, you know --

CHAIR POWERS: Yes, it's a difficult test.

(Crosstalk)

MR. FINLEY: It's one more test and it takes time, and of course there will be a critical path that we have developed at this point in time that will be very important. Takes time. That's really --

CHAIR POWERS: Put a stress on the system that you can just live without?

MR. FINLEY: No, I don't think that's so much a concern, but --

CHAIR POWERS: I mean it clearly does, but the question is, is that a concern? I mean --

MR. FINLEY: I think it's just to try to do the testing we need to do but not do the testing we don't need to do. It's just a control of scope more or less.

CHAIR POWERS: Yes. I mean tests are expensive. Tests are a pain in the neck. Computer programs are much easier in this world, and data can cause things like hiccups and things like that. Tests have hiccups.

MR. FINLEY: Right.

CHAIR POWERS: It's also a test that could be used to good effect to reassure your consuming public.

MR. FINLEY: Understood, understood.

Okay, Slide 21 speaks to specific operator training requirements, and here we follow directly the

operator training and participation requirements that are described in the Design Certification 14.2.9. No intent to deviate from that.

On Slide 22 --

CHAIR POWERS: How do you see the manpower available for the operators?

MR. FINLEY: I'm sorry?

CHAIR POWERS: How do you see the manpower availability for operators and things like that?

MR. FINLEY: Well, I think that's one very important challenge for us in all of the projects that will be going through this process because you have to staff and you have to train well in advance of this startup process.

You need time on a simulator and that has to be before accepting fuel onsite, and so you're backing up your staffing process by at least two years, you know, from the time you start the commissioning process. So I think it's a challenge to find the qualified individuals and to train those individuals.

I can't tell you, I mean we have a ramp-up plan and we have a point in time when we start that ramp-up plan. Beyond that we haven't identified the availability of the individuals, if you will, to meet that.

I have at least as of a few months ago I know I heard a presentation from the Southern Company folks that had a lot of success in staffing up and training and meeting their commitments in terms of operations staffing, so that gives me some encouragement.

MEMBER STETKAR: If you can keep the economy bad it shouldn't be --

(Laughter)

MR. FINLEY: So that will be a challenge.

CHAIR POWERS: Well, I think there was a general misperception or a general degradation of technically oriented people in this country that would be attracted to these kinds of positions.

And then, you know, I think it's one of those national issues that just doesn't make headlines but geeky guys just don't make headlines. That's all there is to it. But it's a fact they're crucial to the functioning of high technology systems like this.

MR. FINLEY: That's certainly one of our objectives, is and will be, to get experienced, some mix of experienced operators. Certainly, I think most of the operators that we would hire wouldn't have the kind of experience we might want, but we'll have a mix of operators with experience, and we have the benefit

of this not being really a new technology. You know, it's a pressurized water reactor very similar in terms of fuel and other aspects of operation, so it's not really a first-of-a-kind sort of a plant.

CHAIR POWERS: Yes, but it's, I mean it's a big horse plant. It's got four trains. It's got lots of stuff on it. There's lots of stuff here and it's big.

MR. FINLEY: Right. And as I said, we will have a simulator. So we'll have the procedures done and the operators trained on those procedures on the simulator to the extent that we can, prior to actual testing.

Okay, Slide 22 moves to Section 14.3 which is ITAAC. And I have to make a point on the first slide there, Slide 23, that right now we have a total of 1,521 ITAAC. I think that's the current number.

MEMBER STETKAR: That's last count.

MR. FINLEY: So just to break that down, 1,275 at last count now identified in the Design Certification, with an additional 246 supplemented in our COLA. So just as a first step, a large number of ITAAC.

The COLA ITAAC are broken down into three areas. Those for site-specific systems and components,

those that relate to emergency planning and those that relate to physical security. And this is a breakdown that's given to us from the Design Cert. And I'll talk about each of these areas in the next couple of slides.

So Slide 24, to talk a little bit about the site-specific structures and components, we through a process of, again it's described in the Design Certification so we don't depart from that. Through a process of identifying the requirements that must be met by the ITAAC process we've identified those systems, structures and components that will require ITAAC.

We used the interface requirements in the Design Certification to do that. We review safety analyses to look at functional requirements of systems, structures and components to identify that. And we use interface requirements, I think I mentioned already. So we have developed the list of systems and structures and components that need to be subject to ITAAC based on this screening process.

Slide 25, a little bit about the physical security process. NUREG-0800, Standard Review Plan Section 14.3.12 provides specific guidance with respect to the scope of ITAAC, and we're following that guidance.

We have what we'll also incorporate the Tier 1 in the U.S. EPR with respect to physical security,

and then those that aren't in Tier 1 we've added in the COLA program. And then as far as emergency planning, ITAAC, our guidance that we use is the SECY letter that you see there. It provides good criteria for establishing an ITAAC program for emergency planning.

Slide 26. I'm not going to cover the details here, but we have three tables in our FSAR which lay out the safety significant features that need to be tested. That's Table 14.3-1, Table 14.3-2, provides a summary of the screening of the systems and structures as to whether or not ITAAC should be applicable.

And then finally a screening of the interface requirements from the Design Certification we've gone through to identify which ones of those require ITAAC and which don't.

And Slide 27. Finally, this shifts to the piping design acceptance criteria. So at this point all we've done is develop the plan for the piping design acceptance criteria. That plan includes the fact that evaluations will be performed and there's a schedule developed for performing these evaluations. And then the associated information that will be available for NRC and at what time frame for audit, so that plan is developed but the details of that are not yet in place.

And that really concludes our presentation

with respect to Chapter 14. Slide 28 just summarizes. I don't think anything we need to repeat there. Slide 29, conclusions. Again, we have no departures. We have no contentions.

There are 16 COL information items and we've responded to all 16 of those items, so we have submitted RAI responses to all 16 of those items. Not that they're all closed at this point, but we've submitted responses.

CHAIR POWERS: You've done your part. Waiting for feedback of some sort.

MR. FINLEY: And unless there's other questions that concludes our presentation.

MEMBER SKILLMAN: Yes. Mark, where is your simulator going to be, please?

MR. HUNTER: At the site.

MEMBER SKILLMAN: At the site?

MR. HUNTER: At the site, yes.

MEMBER SKILLMAN: Thank you.

MR. FINLEY: Any other questions?

CHAIR POWERS: Additional questions? Well, thank you, Mark.

MR. FINLEY: Okay, thank you very much.

CHAIR POWERS: Excellent presentation as usual.

Arora, your team?

Thank you, Mark.

Arora, why don't we go ahead and get started?

MR. ARORA: Yes, we can get started.

CHAIR POWERS: But I may break about 2:30.

MR. ARORA: That's fine.

CHAIR POWERS: And take a little breather. It's just that we can only take so much of Samantha in one week. We got a good dose of her yesterday so, you know, we've got to kind of break it up a little bit.

MS. CRANE: Okay, I'll keep smiling though, as long as you're nice.

CHAIR POWERS: She's a graduate of one of my courses and so I have great pride.

(Crosstalk)

MR. ARORA: I would like to introduce Dave Jaffe. He's the Chapter 14 project manager, and he'll be facilitating the staff's presentations for typical.

CHAIR POWERS: And he's been here before?

MR. ARORA: Old-timer.

CHAIR POWERS: We've seen him a couple of times.

(Off the record discussion)

MR. COLACCINO: Dr. Powers, while we're waiting, my name's Joe Colaccino. I'm chief of the

Engineering Mechanics Branch. And during the morning session on Calvert Chapter 3 there was a question that Dr. Stetkar raised related to turbine missiles, and I went back and I talked with the branch chief and the reviewer that are involved in that review for both EPR and Calvert.

And what their plan is, is there are open items that are in the both Design Certification and reference COLA related to that issue. And what they thought was the more effective presentation would be to wait for the responses to those open items and come in and talk to the ACRS in Phase 4.

CHAIR POWERS: Okay, we will record that in our minutes, that issue in the minutes to our meeting so it's on our docket.

MR. COLACCINO: Yes, thank you.

CHAIR POWERS: Kathy, you've got that?

MS. WEAVER: Yes.

CHAIR POWERS: Okay. We'll make sure we flag that.

MS. WEAVER: Absolutely.

CHAIR POWERS: And turn bulldog Stetkar loose on your unsuspecting staff, right?

MR. COLACCINO: They're aware now.

CHAIR POWERS: I see. Thank you, Joe.

MR. JAFFE: I'm alarmed that I'm sitting next to a lightning rod. Maybe it would be helpful to divert attention.

In any event, thank you very much. My name is Dave Jaffe. I'm assigned to Licensing Branch 1 in NRO. My principal assignment being Chapter 14, Verification Programs.

I was here earlier this year to discuss with the Subcommittee the contents of our safety evaluation with open items for the Design Certification application. And of course now we're here with the similar work product, the safety evaluation with open items for the first Applicant, lead Applicant.

And in fact, we recognized that in our safety evaluation by having an open item that basically says the review of the certification is still ongoing and it implies the possible feedback between the two.

In our memorandum to Ed Hackett dated December 19th, where we transmitted our safety evaluation with open items, we pointed out that there were no items within our review that rose to the level of interest for discussion by the ACRS. However, we do want to keep you apprised of where we are and the sorts of things that we're discussing with this Applicant.

CHAIR POWERS: Basically our Subcommittee meetings are intended to be boring. I mean that is our strategy, to have very, very boring Subcommittee meetings with no major issues to debate.

MR. JAFFE: In any event, we had an extensive technical staff involved with this application. Surinder Arora, of course, is the lead for this particular combined license application, and I am the project manager, with the assistance of my able colleague Tanya Ford who helped me. Currently I'm on rotation to the Fukushima group in NRR but I'm here for a cameo performance.

CHAIR POWERS: Well, I continue to be impressed at the ability to bring together a large number of reviewers from a variety of different disciplines and get a product out the door in some timely fashion.

I'm fascinated by the organizational structure it takes to do that since I know none of the reviewers is that their sole responsibility. That they have a variety of other tasks that can deter you from completing work on your task. So I continue to think that's one of the strengths that the agency has is these multi-disciplinary kinds of activities. Continue to be impressed that it can be done.

MR. JAFFE: In any event, we reviewed the

application, Chapter 14, and of course Part 10 of the application which contains the ITAAC. We didn't find an unusual number of issues because of course this material is incorporated by reference.

It's broken into two parts. Initial plant test program which has the lion's share of the attention here today, and then the ITAAC will discuss 14.3 after the initial test program.

So I've given you a brief introduction. Samantha Crane will address 14.2, and then we've selected three areas where we think there might be some interest on the part of the Subcommittee and we'll go from there.

Samantha?

MS. CRANE: Thanks, Dave. It's nice to see you again. Good afternoon. I'm Samantha Crane. I'm a technical reviewer in the Mechanical Vendor Branch, even though this review is actually done under the Quality Assurance Branch. Our branch has the lead responsibility for the review of 14.2.

Mainly we're responsible for the administrative parts of it, the quality assurance parts in such as we discussed earlier, the test review team, the startup organization as well as ensuring that the appropriate tests are in the application according to Reg Guide 1.68.

But we do coordinate and rely heavily on the other technical branches to review the tests associated with the systems that they review in their chapters. So for example, if we're looking at the central service water system, the technical reviewer who reviews that would also look at the test to make sure that it would actually be able to verify that the system would be able to perform as designed.

So we currently have three open items that are in the SER, and there's only two that are still open. One of them had closed.

The first item relates to the site-specific test abstract for the ultimate heat sink makeup water system, and the Applicant recently redesigned the system. So in December they gave us 150-page response that affects eight or so sections, so the staff is currently reviewing that.

CHAIR POWERS: What's the hold up?

MS. CRANE: Reviewing a 150-page response that affects all the systems. Well, we have to review the system first, I mean for the system that needs requirements, and then we'll look at the test after that's resolved.

CHAIR POWERS: Excuses. You're still sleeping eight hours a day.

MS. CRANE: The second open item relates to the site-specific test abstract for the central service water system, and the staff is currently reviewing that as well.

And that the last item relates to the inclusion of standard language for the initial test program license conditions, and the Applicant has submitted a response and we've reviewed that and found that acceptable. So that item is now closed.

MEMBER SKILLMAN: Samantha, was the ultimate heat sink makeup water system entirely a COLA item in the Design Certification?

MS. CRANE: I believe so. Is there anything incorporated by reference for the ultimate heat sink makeup water system?

MR. FINLEY: I think the Design Certification, we don't rely on any detailed design information in the Design Certification for UHS makeup. It's a site-specific system which is not described in the Design Certification.

MEMBER SKILLMAN: Thank you. That was my question, thank you. Now I understand why you have a custom review for a custom system under --

MS. CRANE: Yes.

MEMBER SKILLMAN: Thank you. Okay.

MS. CRANE: The next slide is just a list of the site-specific tests that were provided in the application and that were reviewed by the staff. Next slide. Also as we discussed, or as UniStar discussed in the previous presentation, there were a number of COL items that were reviewed.

Just one thing about the natural circulation test. We discussed this for a bit. That was reviewed for the EPR 14.2, and that was based on permission that we had given two plants in the previous generation for dual-unit sites to perform the test on one plant and not on the other. So that's based on having data for the same type of plant. So in the EPR that's also based on having U.S. EPR data. So if you wanted to use the data from Finland or from China there would have to be additional review by the staff to do that. That's how we interpret it.

CHAIR POWERS: It's the Coriolis force, isn't it?

MS. CRANE: It might be.

CHAIR POWERS: I'm absolutely persuaded to that.

MS. CRANE: But it has to do with differences. It's slight differences in design, in regulations, quality assurance, administrative controls

and things like that, that we would need to do additional review.

CHAIR POWERS: I think one of the questions I asked the Applicant was about his familiarity with what I perceived to be a very extensive test program that the Fins have set out. I think I should ask you the same question. Have you had a chance to examine that Finnish test program? And if so, what do you think?

MS. CRANE: We haven't gotten a chance to review that in detail.

CHAIR POWERS: Do you have any access to it? I mean I don't. It's strictly a perception on my part that it --

MS. CRANE: We don't have any direct access to that.

CHAIR POWERS: That's too bad. I'd be interested to see it, I mean just as a comparison. Here you go, Joe. Take a trip to Finland.

MR. COLACCINO: We have taken trips to Finland.

(Crosstalk)

MR. COLACCINO: And, you know, and I'm not going to make any commitments here but possibly, you know, if the staff needed to see something like that in order to make its determination then that's something

that they could work through MDEP, but I don't think they need to do that.

CHAIR POWERS: Well, I don't think there's a need to because we have our own standards and there's nothing to suggest that our own standards are deficient in any way. I think it would just be interesting to see what it is that they've done, because my perception it's very extensive. It would just be interesting. And I still want to know what you guys were doing up there in Finland. I'm sorry, go ahead.

MEMBER SKILLMAN: I'm going to make a comment about --

MS. CRANE: Sure.

MEMBER SKILLMAN: -- this natural circulation test. You know, if I could, this is not intended to be a soapbox but just let me tell you a story.

We had an accident in 1979. B&W never did a natural circulation test. And we went from four pumps to one, 177 fuel assembly plant, PWR 2,500-2,600 megawatts. And we operated on that one reactor coolant pump from March 28th, 1979 through April to May 5 or 6.

We lost our third and final pressurized level instrument which meant we were flying blind and we knew that pump was vibrating. And we didn't know

if it was vibrating because of chlorine, gas, whatever in the world might have been in there, we don't know. It was vibrating.

And those of us who were involved made the decision to stop that pump because we were afraid there could be lots of damage to the reactor coolant system. We did not know what the TMI2 reactor coolant system was going to do. We knew we couldn't get near the reactor building because of radiation levels.

But we did it. We pushed the button and stopped the reactor coolant pump motor and the pump spun down and stopped. And thank heaven, the flow traces showed that we went into natural circulation.

But I will tell you there was a 30 to 45-minute high rate of blood pressure change for a lot of people. What was that system going to do? And it remained in smooth, natural circulation for a year. It would have been very good if we had known in advance of that, that there would be a transition to natural circulation, however that occurs. This is a much larger system. You have 241 fuel assemblies. It's a bigger pot. It's bigger piping. The thermal driving heads are probably approximately the same.

But the idea of doing some form a test to confirm that, by golly, you've got natural circulation

when you need it, probably a really good idea.

MS. CRANE: We don't disagree with that.

MEMBER SKILLMAN: And the message. Lived a life, been there, never forget it.

CHAIR POWERS: The central question of course that the Applicant poses is, if I've got the same piping, the same head, the same driving force --

MEMBER SKILLMAN: Do I have to do it.

CHAIR POWERS: -- is there any different physics? And yes, there is. It depends on latitude and these Coriolis forces. But now are they big enough to affect things? Another question.

MEMBER SCHULTZ: That was one reason why I asked the question about, to the Applicant, what access they would have to the other test programs, because there is certainly a possibility that over time they may come to rely on testing that has been done on other facilities, and need to assure that if that, in fact, happens, we understand it as well and know these types of risks that we might be taking if we assume that tests from other facilities are acceptable or not.

CHAIR POWERS: That, in fact, was the subject of a lot of our discussion yesterday, is at what point do we start accepting other people's stuff into our regulatory system? And as Steve points out, sooner

or later it's going to happen. When do we bite the bullet and how edified are we when we do that biting?

MS. CRANE: Last slide. So just in conclusion, the staff issued 60 RAIs. So these result in changes to the administrative controls for the test program, site-specific test abstracts, and the proposed license conditions.

We evaluated these changes, and with the exception of the two open items that I discussed, we find all of these changes to be acceptable, and we're currently evaluating their response to the RAIs and they're being tracked as open items. So that's 14.2.

CHAIR POWERS: Boy, you guys are easy. You went from 60 to two.

MS. CRANE: We're getting responses that --

(Crosstalk)

MS. CRANE: -- found acceptable so that's helpful having someone to do that.

CHAIR POWERS: Thank you.

MS. CRANE: Thank you.

MR. JAFFE: Can I have my ITAAC team up here? Thanks.

The site-specific ITAAC are contained in R10 of the application, and before we get into the

individual topics of interest there were two cross-cutting, not issues, but areas that we wanted to look into.

First was organizational. It was a bit of a challenge because the ITAAC were not arranged by topic, they were arranged by area within the plant. So our subject matter experts had to comb very carefully through the ITAAC through building by building to make sure that we picked up all the issues.

I did an initial review and was able to hopefully help steer the staff, and we found that there were a number of areas where, within the Standard Review Plan, where there were no ITAAC of interest at all. But I'm very confident that we did find all of the plant-specific ITAACs and the topics that they belong to, and we fully reviewed them.

The second item has to do with what the staff has begun to refer to as inspectability. We feel it's important that the ITAAC be unambiguous. That they be correctly structured such that the correct inspection tests or analyses be accepted and that the acceptance criteria be appropriate and consistent and lead to a regime where at the end of the day assuming everything falls in line that they can be promptly closed out. There won't be any barriers to completing that process.

We have with us Edmund Kleeh who will first discuss the issue of inspectability.

Ed?

MR. KLEEH: Good afternoon. My name is Ed Kleeh, a reactor operation engineer in the NRR ITAAC Branch. I reviewed the site-specific ITAAC for the Calvert Cliffs application for inspectability to determine if the ITAAC could be formed, inspected and closed out as written. The basis for these reviews are the Standard Review Plan, Section 14.3 and RIS 2008-05, lessons learned to improve ITAAC submittals.

The RIS identified orders of improvement for ITAAC submittals and placed them into five general categories, each having several improvements. The first category is ITAAC Format and Content. One example of improvement is that the Applicant could have a consistent system for identifying the number of ITAAC.

The second category is ITAAC nomenclature and language. One example of improvement is that the Applicant could clearly define all ambiguous terms in the ITAAC. The third category is ITAAC inspection focus and practicality.

Two examples of improvements are, is that an ITAAC should not address the large construction area or construction activities that are widely separated

in time. Also design commitments in the ITAAC itself should be consistent with each other.

The fourth category is ITAAC standardization of consistency. Two examples of improvements are that the inspection, test and analysis, the ITA and the acceptance criteria for a given ITAAC should be in agreement with one another. Also an ITAAC should agree with Tier 1 and Tier 2 information. The fifth category is ITAAC scope. One example of improvement is that the ITAAC should be written in a clear and objective manner. Next slide.

There are two RAIs with my review for 360 and 361. They both have open issues. RAI 360 has 13 open issues with those broken down into the five categories I just talked about as shown on the slide. Next slide.

RAI 361 has 18 open issues with those broken down in the five categories as shown on the slide. The staff has reviewed the Applicant's responses to both RAIs and have prepared comments which we are now reviewing. Thank you.

MR. PARK: Good afternoon. My name is Sunwoo Park, again, structural engineer at the Division of Engineering. The section 14.3.2 deals with structural and the systems engineering ITAAC, and we

have only one open item in this section. And that open item concerns Seismic Category 2 structures and Seismic, also the Seismic 2-over-1 interaction issue.

The SRP provides the guidance that ITAAC be established to verify that failure of any non-Seismic Category I systems, structures and components will not impair the safety capability of nearby safety-related SSCs II/I interactions. And also staff noted that there are interface requirements contained in the U.S. EPR FSAR which must be met by the COL Applicants by providing design information and ITAAC.

In order to address interface requirements that belong to Seismic Category II structures the Applicant committed in the FSAR table to provide design information that demonstrates prevention of II/I interactions. Specifically the Applicants proposed to design Seismic Category II structures to the requirement of Category I structures thereby ensuring that Category II structures will remain functional under safe shutdown earthquake.

Now the Applicants still need to provide the committed information in the updated FSAR. That's the only slide that I have.

MR. LAW: My name is Yiu Law. I work at the Engineering Mechanics Branch in the Division of

Engineering. The EMB branch is the branch that does the review for 14.3.3 piping systems and components ITAAC, and the basis for this review is FSAR 14.3.3 piping system, components and ITAAC.

And we have five RAIs and of which two of those are open items. The first one is RAI 161, Question 14.3.3-2. For clarity and inspectability the staff determined that three ITAACs are necessary and sufficient to cover the piping system and components are designed, and covering design for application and installation and as-built reconciliation, to ensure that the piping systems and components are properly designed and constructed in accordance with the ASME Section III requirements.

In this particular open items, the staff found that for the ultimate heat sink makeup water system there are only two ITAACs to cover the three requirements. They combined the fabrication and installation ITAAC and the as-built reconciliation ITAAC into one ITAAC. Next slide, please.

The second finding is that for the component design ITAAC that the wording says an inspection to verify the existence of an ASME design code reports in appropriate. The content of the report should be the focus of the inspection, not just simply the fact that

a report exists.

The third point is for the piping system reconciliation ITAAC, the wording now has a statement, "Piping, including supports, analyzed using time history will be reconciled to the as-built information." And the staff found that that's misleading because it restricts to those piping systems analyzed using time history methods, while the ITAAC should cover all of the piping systems. Next slide, please.

And the second open item is RAI 374, Question 14.3.3-5. For the fire protection building ventilation system an ITAAC is needed to ensure the Seismic Category II equipment and component system can withstand the seismic design basics load without impacting the Seismic Category I structures and equipment to perform the safety functions.

We issued an RAI and the response came back, and within the Applicant's response we found that instead of addressing Seismic Category II they used the term "Conventional Seismic," which is in line with AREVA Seismic Category convention, but this issue is being addressed in a different RAI, 253, Question 3.7.2-45 in the Structure Engineering Branch and that RAI has not been resolved yet. And this concludes my portion of the presentation.

MR. JAFFE: We had safety evaluation input in the areas of plant systems and electrical. Neither one of those produced any open items nor issues where they have discussion at this time. However, we do have those subject matter experts available should the subcommittee wish to inquire.

CHAIR POWERS: I don't think we have any questions on those.

MR. JAFFE: Thank you very much.

CHAIR POWERS: Maybe we should but we didn't.

Arora, did you have any closing comments you wanted to make?

MR. ARORA: No. I thank the Subcommittee for giving us the opportunity to present the two chapters.

CHAIR POWERS: Well, once again you brought more than was promised, things where there was a clear pathway to resolve the open items, and we appreciate that. That's one of the reasons this whole system works.

Again I congratulate all concerned with the organization of a multi-disciplinary effort which I know is very difficult to do, and I think you can come with some confidence in being successful in doing that.

It is amazingly difficult when you're using

these matrix structures where people have multiple tasks and you have to get them focused in to getting a product out. I struggle to try to communicate this to the Commission how difficult these two words are, but at least I do appreciate what you've accomplished here and thank you very much.

Do we have any other questions we want to pose to the staff in these areas? We have not yet decided on a time for presenting this material to the full Committee. I think there's no difficulty in finding time we just haven't done it yet, is that right?

MS. WEAVER: Well, you were going to complete the Phase 2 review prior to doing that. That's what we last discussed. And that would be up to the staff when they come to the Subcommittee with those remaining chapters.

CHAIR POWERS: Yes, I think we just want to wait for the rest of the chapters.

MR. ARORA: We have two more complete chapters and one partial chapter to go.

CHAIR POWERS: So we'll lump them all together and get it all into --

MR. ARORA: Right, in one full Committee at the end of --

CHAIR POWERS: That's right. I think

that's just a matter of, I mean it's an administrative milestone more than a technical milestone there. Things can proceed apace without waiting anything. I believe we've identified some issues in the course of the Subcommittee meeting that can, will be resolved in the Phase 4 kinds of deliberations. I didn't see anything that was a barrier to moving into that phase. I think that is true.

Any of the Committee members have comments they care to make? I have no evidence that there's anyone on our phone bridgeline that wants to make comments, but I will ask. If there's anybody on the bridgeline that wants to make comments please do so.

And with my usual patience I hear none, so I will close this Subcommittee meeting and I think we're done. Thank you.

(Whereupon, the foregoing matter went off the record at 2:35 p.m.)

UNISTAR NUCLEAR ENERGY

Presentation to ACRS
U.S. EPR™ Subcommittee
Calvert Cliffs Nuclear Power Plant Unit 3
FSAR Chapter 3, Design of Structures, Components, Equipment, and Systems
January 17, 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 03, Design of Structures, Components, Equipment and Systems occurred on February 21, 2012.

Introduction

- One (1) Departure and one (1) Exemption from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 3
- No ASLB Contentions
- Seventy-six (76) COL Information Items

Introduction

- Today Mark Finley, UniStar Senior Vice President, Regulatory Affairs & Engineering, will present the Calvert Cliffs Unit 3 FSAR Chapter 03.

- Today's Presentation was prepared by UniStar and is supported by Bechtel, Rizzo Associates and AREVA.

  - Antonio Fernandez, UniStar – Structural/Seismic Engineering
  - Onur Tastan, Rizzo Associates – Structural/Seismic Engineering
  - Shankar Rao, Bechtel – Project Engineer
  - Todd Oswald, AREVA – U.S. EPR Technical Consultant Civil Structural
  - Russell Wells, AREVA – U.S. EPR COLA Licensing Manager

- The focus of today's presentation will be on site-specific information that supplements the U.S. EPR FSAR.

Chapter 3, Design of Structures, Components, Equipment and Systems
Agenda

- 3.1 Compliance with Nuclear Regulatory Commission General Design Criteria
- 3.2 Classification of Structures, Systems, and Components
- 3.3 Wind and Tornado Loadings
- 3.4 Water Level (Flood) Design
- 3.5 Missile Protection
- 3.6 Protection Against Dynamic Effects Associated with Postulated Rupture of Piping
- [3.7 Seismic Design] – Deferred to Phase 4
- 3.8 Design of Category I Structures
- 3.9 Mechanical Systems and Components
- 3.10 Seismic and Dynamic Qualification of Mechanical And Electrical Equipment
- 3.11 Environmental Qualification Of Mechanical And Electrical Equipment
- 3.12 ASME Code Class 1, 2, And 3 Piping Systems, Piping Components, & Associated Supports
- 3.13 Threaded Fasteners (ASME Code Class 1, 2, and 3)
- Conclusions

Design of Structures, Components, Equipment and Systems

3.1 Compliance with NRC General Design Criteria

Design of Structures, Components, Equipment and Systems COL Information Items/Supplemental

- COL applicant will identify the site-specific QA Program Plan that demonstrates compliance with GDC 1.

Criterion 1 – Quality Standards and Records

- The QA Program is provided in the Quality Assurance Program Description, (QAPD) as described in Chapter 17.
  - The QAPD demonstrates compliance with GDC 1.

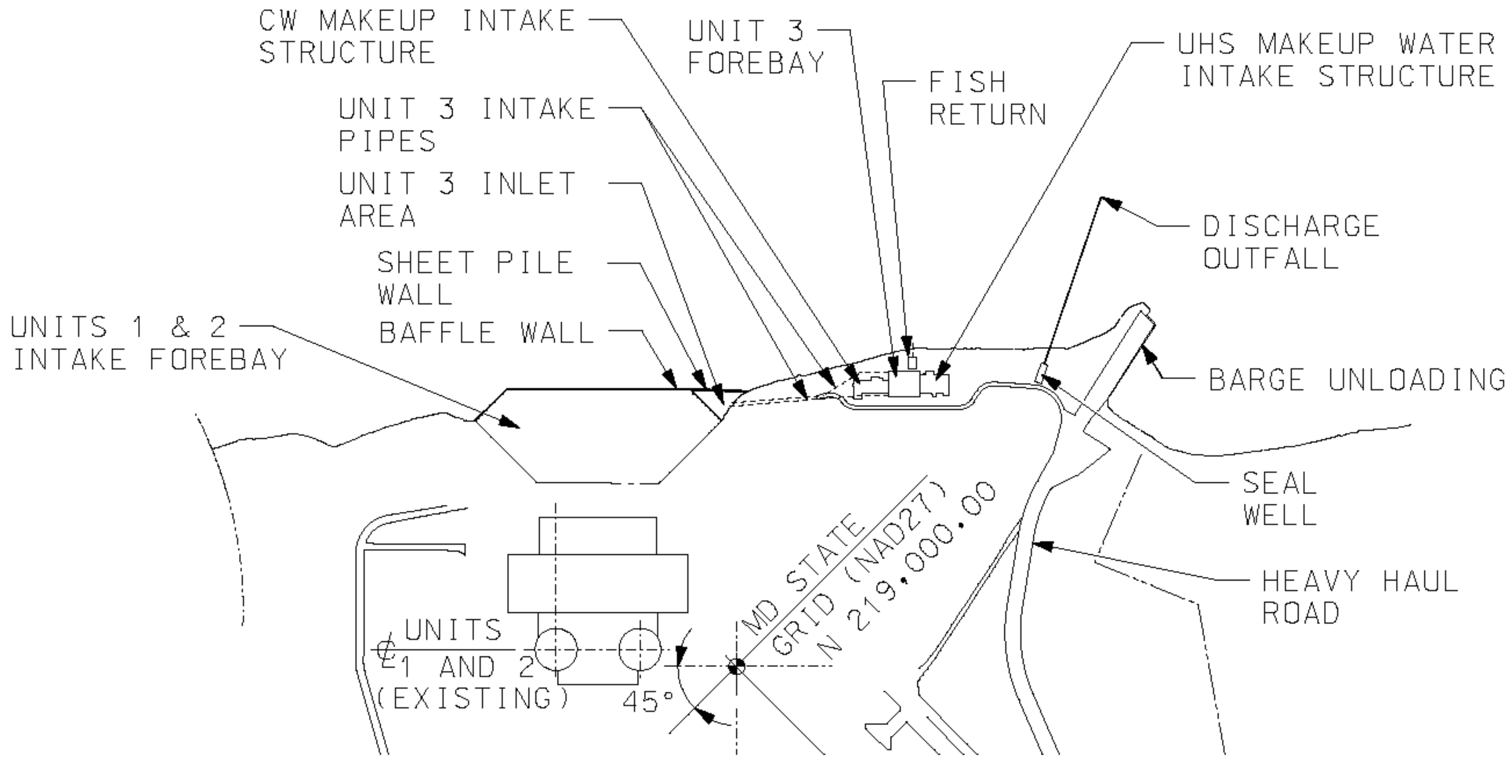
Supplemental Section 3.1.1.5.1

Criterion 5 – Sharing of Structures, Systems, and Components

- Calvert Cliffs Unit 3 shares the following structures, systems, and components with Calvert Cliffs Units 1 and 2:
  - Offsite transmission system
  - Existing Chesapeake Bay intake channel and embayment
  - Meteorological tower
  - Emergency Operations Facility (EOF)
- These structures, systems, and components are designed such that an accident in one unit would not impair their ability to perform their function for any other unit.

Design of Structures, Components, Equipment and Systems Supplemental Information

Figure 2.4-49 --UHS Make-Up Intake Structure



3.2 Classification of Structures, Systems, and Components

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will identify the seismic classification of applicable site-specific SSCs that are not identified in U.S. EPR FSAR Table 3.2.2-1.
- A COL applicant will identify the quality group classification of site-specific pressure-retaining components that are not identified in Table 3.2.2-1.

<u>Seismic Classification</u>

- ➢ Seismic classifications for applicable site-specific structures, systems, and components (SSCs) and the quality group classification
  - Provided in Table 3.2-1
  - Classifications reflect COLA Revision 8, subsequent RAI 253 & RAI 330 responses not reflected.
  - Current classifications being made consistent with US EPR.

3.3 Wind and Tornado Loadings

Design of Structures, Components, Equipment and Systems COL Information Items

- COL applicant will determine site-specific wind and tornado characteristics and compare to standard plant & evaluate the design for site-specific wind and tornado events and demonstrate the ability of safety-related structures to perform their safety functions.

Wind and Tornado Loadings

➢ For generic and site-specific structures, the U.S. EPR FSAR design wind and tornado parameters bound the site-specific wind and tornado characteristics.

- Site-specific Seismic Category I structures utilize the U.S. EPR design wind and tornado parameters for their design:
  - ✓ Forebay
  - ✓ Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS)

Design of Structures, Components, Equipment and Systems COL Information Items

- COL applicant will demonstrate that failure of site-specific structures or components, and not designed for wind loads, will not affect the ability of other structures to perform their intended safety functions.

Wind Loadings

- Site-specific non safety-related structures not included in the U.S. EPR standard plant design are designed for the site-specific wind loads.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will demonstrate that failure of site-specific structures or components not included in the U.S. EPR design, and not designed for tornado loads, will not affect the ability of other structures to perform their intended safety functions.

Tornado Loadings

➢ The failure of site-specific structures or components due to tornado loads will not affect the ability of other structures to perform their intended safety functions.
  - The Switchgear Building has a potential for interaction with safety-related structures, is designed to withstand the effects of tornado loadings the same as the Seismic Category I structures.
  - The concrete portion of Circulating Water System Makeup Water Intake Structure is designed for tornado loadings the same as the Seismic Category I structures.
  - Other site-specific structures are distant enough from safety-related structures that their collapse due to tornado loadings would not result in adverse interaction with any safety-related structure, therefore they are not designed for tornado loadings.

3.4 Water Level (Flood) Design

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will confirm the potential site-specific external flooding events are bounded by the U.S. EPR design basis flood values or otherwise demonstrate that the design is acceptable.
- A COL applicant will perform a flooding analysis for the ultimate heat sink makeup water intake structure based on the site-specific design of the structure.

External Flooding

- ➢ The U.S. EPR FSAR requires the Probable Maximum Flood elevation to be 1 foot below finished yard grade.
  - This requirement envelops the maximum site-specific flood level (3 feet below grade) for safety-related structures in the power block.
  - The Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS) is not located at the power block and is addressed separately:
    - ✓ Maximum wave run up is 33.2 feet – bottom of Heating, Ventilation, and Air Conditioning (HVAC) intakes 36.5 feet
    - ✓ Designed to be watertight to prevent flooding of the buildings
    - ✓ Designed to withstand the static and dynamic flooding forces

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will perform internal flooding analyses prior to fuel load for the Safeguard Buildings and Fuel Building to demonstrate that the impact of internal flooding is contained within the Safeguard Building or Fuel Building division of origin.
- A COL applicant will perform an internal flooding analysis prior to fuel load for the Reactor Building and Reactor Building Annulus to demonstrate that the essential equipment required for safe shutdown is located above the internal flood level.

Internal Flood Protection

- ➢ Will be responded to in a future RAI response

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will perform a flooding analysis for the ultimate heat sink makeup water intake structure based on the site-specific design of the structure.

Internal Flood Protection (Continued)

- In the event of flooding, due to equipment or piping failure within a UHS Makeup Water pump room,
  - Flood protection measures for the UHS Makeup Water Intake Structure ensure that a flood in one division will not impact another division.

Design of Structures, Components, Equipment and Systems

3.5 Missile Protection

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will confirm the evaluation of the probability of turbine missile generation for the selected turbine generator, P1, is less than 1E-4 for turbine generators favorably oriented with respect to containment.

Main Turbine Missile Analysis

- A turbine missile analysis has been developed for the selected turbine design (Alstom).
  - The analysis includes missile generation probabilities versus service time for the HP/IP and LP turbine rotors.
  - Inspection requirements for the turbine rotors during major overhauls ensure that indications of Stress Corrosion Cracking (SCC) will be detected.
    - ✓ Consistent with the turbine manufacturer recommended inspection intervals required to meet the calculated failure probability of the turbine rotor.
  - Turbine missile analysis demonstrates that the probability of turbine rotor failure
    - ✓ P1, is less than 1E-4 for a favorably oriented turbine with respect to the containment consistent with the guidance in RG 1.115.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will assess the effect of potential turbine missiles from turbine generators within other nearby or co-located facilities.

Main Turbine Missile Analysis from Calvert Cliffs Units 1 & 2

- Calvert Cliffs Units 1 and 2 FSAR Section 5.3.1.2
  - P_1 is less than 1E-5 per year, below the threshold value of 1E-5 described in Calvert Cliffs Units 1 and 2 UFSAR.
- Orientation of Calvert Cliffs Unit 1 and Unit 2 turbines are located outside the low trajectory strike zones as described in Regulatory Guide 1.115.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will evaluate the potential for other missiles generated by natural phenomena, such as hurricanes and extreme winds, and their potential impact on the missile protection design features of the U.S. EPR.

Missiles Generated by Tornadoes and Extreme Winds

- ➢ Seismic Category I structures in the U.S. EPR standard design meet the most stringent Region I tornado intensity requirements of Regulatory Guide 1.76.
  - The associated tornado wind speeds (230 mph maximum) represent an exceedance frequency of 1E-07 per year.
- ➢ The Calvert Cliffs Unit 3 site
  - Using Regulatory Guide 1.76, Figure 1, this site lies in tornado intensity Region II. The associated wind speeds (200 mph maximum) represent an exceedance frequency of 1E-07 per year.
  - As such, the Region I wind speed and resulting missile spectrum used for the U.S. EPR standard and site-specific structures is conservative with respect to the Regulatory Guide 1.76 acceptance criteria.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will evaluate the potential for other missiles generated by natural phenomena, such as hurricanes and extreme winds, and their potential impact on the missile protection design features of the U.S. EPR.

Missiles Generated by Tornadoes and Extreme Winds (Continued)

➢ Potential missiles generated by the detachment of the siding panels of the Switchgear Building at the Calvert Cliffs Unit 3 during a Region I tornado event were evaluated.

  ✓ Seismic Category I structures at the Calvert Cliffs Unit 3 Site, the target response ductility and required minimum wall thickness for these postulated panel missiles were found to be enveloped by those for the Regulatory Guide 1.76 Region I missile spectrum.

➢ The UHS makeup water system buried components, including underground piping, cables, and instrumentation from the UHS makeup water intake structure to the essential service water pump building are buried at a sufficient depth to withstand the effects of postulated missile hazards.

Design of Structures, Components, Equipment and Systems COL Information Items

- For sites with surrounding ground elevations that are higher than plant grade, a COL applicant will confirm that automobile missiles cannot be generated within a 0.5 miles radius of safety-related SSC that would lead to impact higher than 30 feet above plant grade.

<u>Missiles Generated by Tornadoes and Extreme Winds (Continued)</u>

- ➢ The highest elevation within the 0.5 mile radius at Calvert Cliffs Unit 3 is at an approximate elevation of 130 feet. Adding the 30 feet requirement, all elements below elevation 160 feet require evaluation of the automobile missile per RG 1.76.
  - Standard Plant Category 1 structure design meets Region 1 tornado missile spectrum requirements
  - Site-specific Seismic Category I Ultimate Heat Sink (UHS) Makeup Water Intake Structure and Forebay is constructed of reinforced concrete, and the missile barrier walls and roof slabs
    - ✓ Meet Region 1 design-basis missile spectrum, including the automobile missile guidance of RG 1.76.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will evaluate the potential for site proximity explosions and missiles generated by these explosions for their potential impact on missile protection design features.
- A COL applicant will evaluate site-specific aircraft hazards and their potential impact on plant SSC.

Site Proximity Missiles

- In accordance with Regulatory Guide 1.206, the following missile sources have been considered and are discussed in Calvert Cliffs Unit 3 FSAR Section 2.2:
  - Train or truck explosions
  - Ship or barge explosions
  - Industrial facilities
  - Pipeline explosions
  - Military facilities
  - Aircraft accidents
  - Evaluation acceptance criteria for these hazards are in accordance with Regulatory Guides 1.91,1.78, and 1.170
- None of the potential site-specific external event hazards evaluated resulted in an unacceptable effect important to the safe operation of Calvert Cliffs Unit 3.

3.6 Protection Against Dynamic Effects Associated with Postulated Rupture of Piping

(This section of the U.S. EPR is Incorporated by Reference)

3.8 Design of Category I Structures

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will describe any differences between the standard plant layout and design of Seismic Category I structures required for site-specific conditions.
- A COL applicant will address site-specific Seismic Category I structures that are not described in the U.S. EPR.

<u>Description of the Structures</u>

➢ The standard plant layout and design of other Seismic Category I Structures is as described in the U.S. EPR FSAR without departures.

➢ The site-specific Seismic Category I structures are:

- Forebay and UHS Makeup Water Intake Structure (MWIS)
- Buried Conduit Duct banks
- Buried Pipe

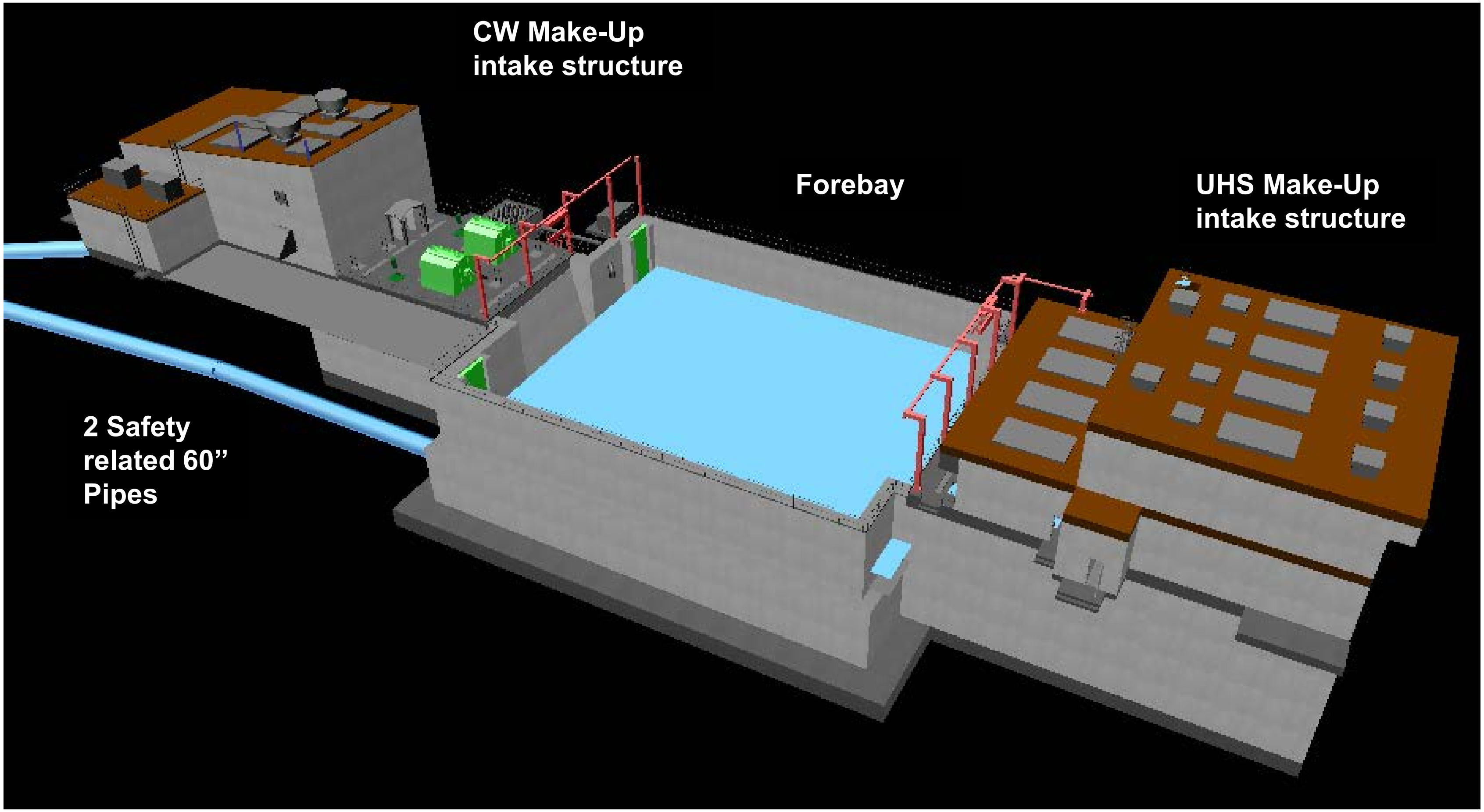
Design of Structures, Components, Equipment and Systems COL Information Items

- COL applicant will describe site-specific foundations for Seismic Category I structures that are not described in the U.S.EPR.

<u>Forebay and UHS Makeup Water Intake Structure</u>

- The Seismic Category I Forebay and UHS MWIS are reinforced concrete structures situated along Chesapeake Bay.
- The UHS MWIS is integrally connected with the Forebay basemat.
- Seismic Category II CWS Makeup Water Intake Structure and Seismic Category I Forebay and UHS Makeup Water Intake Structure share a 5 ft thick common basemat.

Design of Structures, Components, Equipment and Systems COL Information Items



Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will address site-specific Seismic Category I structures that are not described in the U.S. EPR.

<u>Forebay and UHS Makeup Water Intake Structure (Continued)</u>

➢ Forebay and UHS Makeup Water Intake Structure
  - Reinforced concrete shear wall and slabs are designed for seismic (including hydrodynamic loads) and non-seismic load combinations.
  - Exterior walls of the are designed to withstand
    - ✓ Tornado missile impact and
    - ✓ Wave pressures of the Probable Maximum Hurricane (PMH)
    - ✓ Standard Project Hurricane (SPH) severe environmental event
  - Checked for sliding, overturning, and flotation using the stability load combination

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will address critical sections relevant to site-specific Seismic Category I structures.

APPENDIX 3E-DESIGN DETAILS AND CRITICAL SECTIONS FOR SAFETY-RELATED CATEGORY I STRUCTURES

- ➢ Section 3E.4 of Appendix 3E provides the discussion regarding the critical sections of the site-specific Seismic Category I Structures:
  - Forebay
  - Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS)
- ➢ Section 3E.4 concludes:
  - Critical sections of the Forebay and UHS Makeup Water Intake Structure
    - ✓ Demonstrate adequate strength to resist the structural loads from various design basis events,
    - ✓ Demonstrate that the minimum required factors of safety against sliding, overturning and flotation loading conditions are met.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will provide a description of Seismic Category I buried duct banks and pipe.

Buried Duct Banks

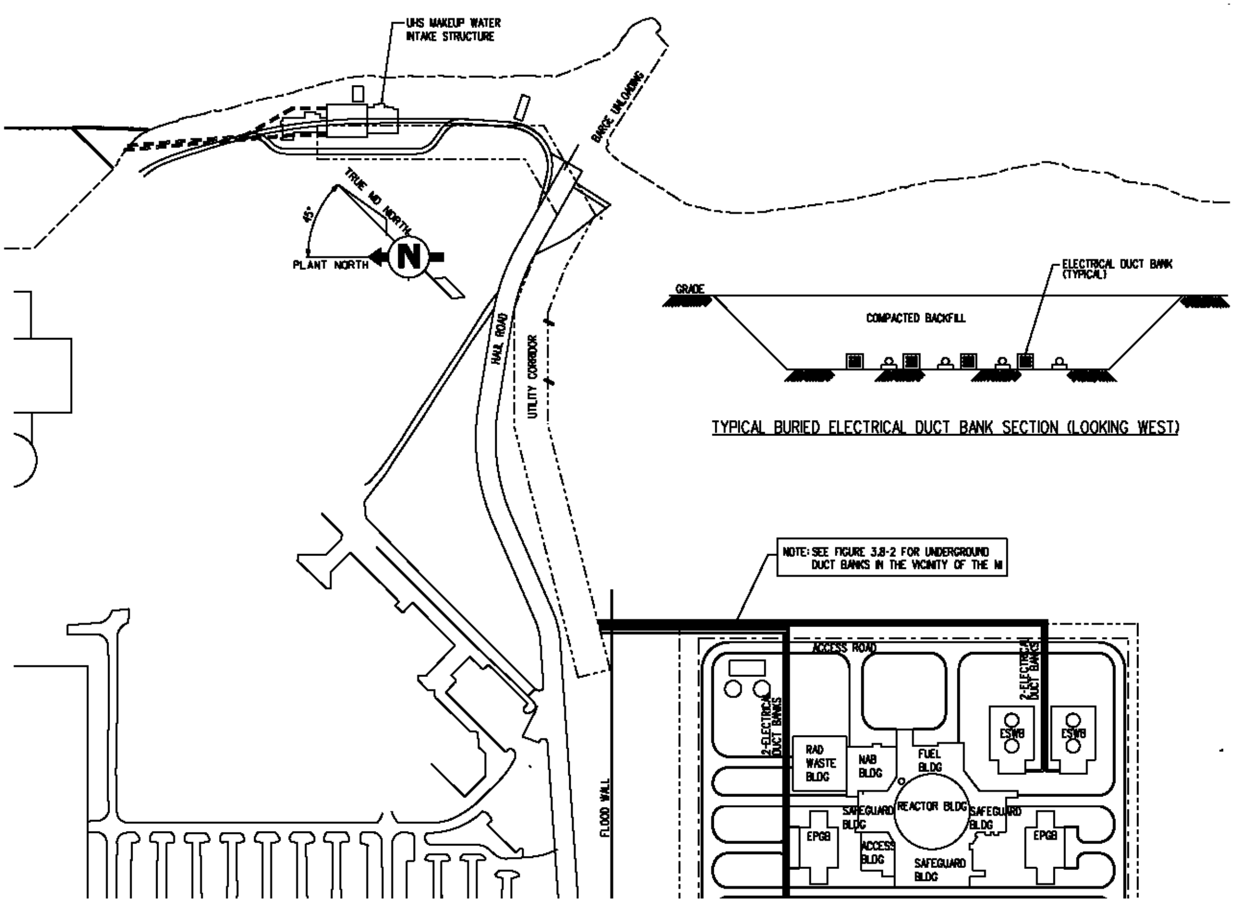
- Buried electrical duct banks consist of polyvinyl chloride conduit encased in reinforced concrete.
  - Reinforced concrete facilitates maintenance of conduit spacing / separation requirements and protects the conduit.

Buried Pipe

- The buried piping is directly buried in the soil
  - Additional protection provided as required.
  - Depth of the soil cover is sufficient to provide protection against frost surcharge effects, and tornado missiles.
  - Structural fill is used as bedding material underneath the pipe, as an alternate, lean concrete may be used.
  - Soil surrounding the pipe is compacted structural fill.

Design of Structures, Components, Equipment and Systems COL Information Items

Figure 3.8-1— {Schematic Site Plan of Seismic Category I Buried Utilities (Electrical Duct Banks)}



Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will describe the design and analysis procedures used for buried duct banks and buried pipe.
- A COL applicant will use results from site-specific investigations to determine the routing of buried pipe.
- A COL applicant will perform geotechnical engineering analyses to determine if the surface load will cause lateral or vertical displacement of bearing soil for the buried pipe.

<u>Buried Duct Banks and Buried Pipe</u>

- Analysis and design of Seismic Category I site-specific buried duct banks and buried pipes will be in accordance with the procedures outlined in U.S. EPR FSAR AREVA NP Topical Report ANP-10264NP-A.
- Terrain topography and geotechnical site investigation will be used as design input to confirm the routing of buried pipe and duct banks reflected in U.S. EPR FSAR.
- Buried pipes are located such that the top surface of the pipe is below the site-specific frost depth, with additional depth used to mitigate the effects of surcharge loads and tornado or turbine generated missiles.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will confirm that site-specific conditions for Seismic Category I buried conduit, electrical duct banks, pipe, and pipe ducts satisfy the criteria specified in the U.S. EPR.

<u>Structural Acceptance Criteria</u>

➢ Buried electrical duct banks, buried Essential Service Water Pipes, buried UHS Makeup Water Pipes, and Intake Pipes meet:

- Requirements specified in U.S. EPR FSAR and the AREVA NP Topical Report ANP-10264NP-A
- Additional acceptance criteria for the buried electrical duct banks
  - ✓ IEEE-628, ASCE 4-98 and ACI 349-01, supplemental guidance of RG 1.142

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will confirm that site-specific loads lie within the standard plant design envelope for the RCB, or perform additional analyses to verify structural adequacy.
- A COL applicant will confirm that site-specific loads lie within the standard design envelope for RB internal structures, or perform additional analyses to verify structural adequacy.

Loads and Load Combinations

➢ FSAR Table 2.0-1 provides a comparison of Calvert Cliffs Unit 3 site characteristics to the parameters defining the basis of the U.S. EPR FSAR design loads.

- With the exception of the low frequency range of the site-specific Safe Shutdown Earthquake (SSE), site-specific loads are confirmed to lie within the standard U.S. EPR design certification envelope.
- A detailed seismic reconciliation analysis is performed, to verify that the In-Structure Response Spectra (ISRS) lies within the standard U.S. EPR design certification envelope.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will confirm that site-specific loads lie within the standard design envelope for other Seismic Category I structures, or perform additional analyses to verify structural adequacy.

Loads and Load Combinations (Continued)

➢ Design loads defined in the U.S. EPR FSAR are applicable for the design of site-specific Seismic Category I structures, with the following exceptions:

- Design live load due to rain, snow and ice is based on the site specific normal and extreme winter precipitation events.
- Static lateral soil pressure is calculated based on site-specific soil parameters and groundwater elevation.
- Safe shutdown earthquake
  - ✓ Site-specific SSE has a peak ground acceleration of 0.15 g.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will confirm that site-specific loads lie within the standard design envelope for other Seismic Category I structures, or perform additional analyses to verify structural adequacy.

<u>Loads and Load Combinations (Continued)</u>

➢ Additional design loads for site-specific Seismic Category I structures
  - Wave pressure on the exterior walls of the UHS Makeup Water Intake Structure
  - Concurrent hurricane wind pressure for design of site-specific Seismic Category I structures
    - ✓ Based on the U.S. EPR standard design for Severe Environment (SPH) and Extreme Environment (PMH)
  - UHS Makeup Water Intake Structure
    - ✓ Peak positive incident overpressure of at least 1 psi without loss of function (RG 1.91)

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will evaluate the waterproofing and dampproofing system of Seismic Category I foundations subjected to aggressive environments.

Materials

- 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 below the water table
  - Emergency Power Generating Buildings (EPGBs) and Essential Service Water Buildings (ESWBs) are not affected – above water table.
  - 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).

Design of Structures, Components, Equipment and Systems COL Information Items

- COL applicant will describe the program to examine inaccessible portions of below-grade concrete structures for degradation and monitoring of groundwater chemistry.

Testing and Inservice Inspection Requirements

- 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

Design of Structures, Components, Equipment and Systems COL Information Items

- COL applicant will address examination of buried safety-related piping in accordance with ASME Section XI, IWA-5244, "Buried Components."
- COL applicant will identify site-specific settlement monitoring requirements for Seismic Category I foundations based on site-specific soil conditions.

Testing and Inservice Inspection Requirements (continued)

- An examination of buried safety-related piping will be made in accordance with ASME Section XI, IWA-5244, "Buried Components."
- Soil settlement monitoring program satisfies
  - 10 CFR 50.65 and RG 1.160 as applicable to structures.
  - Measured settlements will be evaluated if found to be trending greater than expected values to ensure compliance with design basis requirements.

Design of Structures, Components, Equipment and Systems COL Information Item

- A COL applicant will evaluate site-specific methods for shear transfer between the foundation basemats and underlying soil for site-specific soil characteristics.

<u>Structural Acceptance Criteria</u>

➢ Nuclear Island (NI) common basemat structures, Emergency Power Generating Buildings (EPGBs), and Essential Service Water Building (ESWBs)

- U.S. EPR FSAR specifies a minimum coefficient of friction of 0.5 for interfaces between the foundation basemat and soil, or for cohesive soil cases that have an undrained strength greater than or equal to a drained strength of 26.6 degrees.
- A previous departure to this value was recently withdrawn in the response to RAI 370.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will compare the NI common basemat site-specific predicted angular distortion to the angular distortion in the relative differential settlement contours in the U.S. EPR.

Nuclear Island (NI) Common Basemat Structure Foundation Basemat

- ➢ Site-specific soil spring values are the same as the values used in the U.S. EPR Standard Plant settlement analysis.
  - Construction sequence, models, methodologies, and procedures are the same as U.S. EPR.
  - Therefore, predicted angular distortion of the NI common basemat structure is the same for both Calvert Cliffs Unit 3 and the U.S. EPR Standard Plant.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will compare the EPGB site-specific predicted angular distortion to the angular distortion in the total differential settlement contours in the U.S. EPR.
- A COL applicant will compare the ESWB site-specific predicted angular distortion to the angular distortion in the total differential settlement contours the U.S. EPR.

<u>Emergency Power Generating & Emergency Service Water Buildings Foundation Basemats</u>

- ➢ These two COL Items will be addressed in future RAI responses.

Design of Structures, Components, Equipment and Systems Departure/Exemption

Departure/Exemption from Maximum Differential Settlement of 1/2 inch/50 ft (1/1200) Any Direction Across the Basemat

- Emergency Power Generating Buildings (EPGBs) & Essential Service Water Buildings (ESWBs) estimated site-specific differential settlement is higher than the allowable value.
  - Evaluation of the effects of the higher site-specific differential settlement, a finite element analysis of the entire EPGB & ESWB
    - ✓ Effect of a more conservative overall building tilt
    - ✓ Results show that increase in design moment based on the more conservative differential settlement value is less than the U.S. EPR FSAR maximum design moment.
- Therefore, EPGB & ESWB basemats are structurally adequate to resist the increased moments.

3.9 Mechanical Systems and Components

Design of Structures, Components, Equipment and Systems COL Information Items

- Pipe stress and support analysis will be performed by a COL applicant that references the U.S. EPR design certification.
- A COL applicant will either use a piping analysis program based on the computer codes described in Section 3.9.1 and Appendix 3C or will implement a U.S. EPR benchmark program using models specifically selected for the U.S. EPR.

Computer Programs Used in Analyses

- Before fuel load, required pipe stress and support analysis will be performed and shall utilize a piping analysis program based on the computer codes described in U.S. EPR FSAR Section 3.9.1, and U.S. EPR FSAR Appendix 3C as supplemented by COLA FSAR Section 3.9.1.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will prepare the design specifications and design reports for ASME Class 1, 2, and 3 components, piping, supports, and core support structures. They will address the results and conclusions from the reactor internals material reliability programs.

ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures

- Design specifications and design reports will be prepared for ASME Class 1, 2, and 3 components that comply with and are certified to the requirements of Section III of the ASME Code (ASME, 2004).
- Response to COLA RAI 366, Question 03.02.02-7, provided NRC a list of the site-specific design specifications and when they will be available for NRC audit.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will provide a summary of the maximum total stress, each of the component operating conditions for ASME Code Class 1 components and for Class 2 and 3 components required for safe shutdown.

ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures

➢ Will be addressed by a future RAI response.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will provide a summary of reactor core support structure maximum total stress, deformation, and cumulative usage factor in conformance with ASME Section III Subsection NG.

Reactor Pressure Vessel Internals

- Will be addressed by a future RAI response.

Design of Structures, Components, Equipment and Systems COL Information Items

- As noted in ANP-10264NP-A, a COL applicant will confirm that thermal deflections do not create adverse conditions during hot functional testing.
- A COL applicant will examine the feedwater line welds after hot functional testing and report the results of inspections to the NRC, in accordance with NRC Bulletin 79-13.

ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures (continued)

➢ Will be addressed by a future RAI response.

Design of Structures, Components, Equipment and Systems

Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints

- CCNPP3 FSAR incorporates by reference the description of functional design, qualification, and IST programs for pumps, valves, and dynamic restraints in U.S. EPR FSAR with supplemental information and site-specific pump and valve testing provisions

- Functional design and qualification of pumps, valves, and dynamic restraints will apply ASME Standard QME-1-2007 as accepted in Revision 3 to RG 1.100

- IST program at CCNPP3 will be developed to implement the provisions in U.S. EPR FSAR as supplemented by CCNPP3 FSAR

3.10 Seismic and Dynamic Qualification of Mechanical and Electrical Equipment

3.11 Environmental Qualification of Mechanical and Electrical Equipment

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will identify any additional site-specific components and added to Table 3.10-1.

Seismic and Dynamic Qualification of Mechanical and Electrical Equipment

- A list of site-specific seismically and dynamically qualified mechanical, electrical, and instrumentation and control equipment is provided in Table 3.10-1.

Design of Structures, Components, Equipment and Systems COL Information Items

- A COL applicant will identify additional site-specific components and add to the environmental qualification list in Table 3.11-1.

Environmental Qualification

- ➢ Will develop and maintain a list of electrical equipment meeting the criteria of 10 CFR 50.49, FSAR Table 3.11-1 provides the list of additional site-specific components.

3.12 ASME Code Class 1, 2, and 3 Piping Systems, Piping Components, and their Associated Supports

Design of Structures, Components, Equipment and Systems Supplemental

Supplemental Section-3.12.5

Seismic Input Envelope vs Site-Specific Spectra

- Site-specific In-Structure Response Spectra (ISRS) based on foundation input response spectra for site-specific structures.
  - Used for the pipe stress and support analysis of site-specific systems within the Ultimate Heat Sink (UHS) Makeup Water Intake Structure (MWIS).

3.13 Threaded Fasteners (ASME Code Class 1, 2, and 3)

(This section of the U.S. EPR is Incorporated by Reference)

Chapter 3, Design of Structures, Components, Equipment and Systems
Agenda

- 3.1 Compliance with Nuclear Regulatory Commission General Design Criteria
- 3.2 Classification of Structures, Systems, and Components
- 3.3 Wind and Tornado Loadings
- 3.4 Water Level (Flood) Design
- 3.5 Missile Protection
- 3.6 Protection Against Dynamic Effects Associated with Postulated Rupture of Piping
- [3.7 Seismic Design] – Deferred to Phase 4
- 3.8 Design of Category I Structures
- 3.9 Mechanical Systems and Components
- 3.10 Seismic and Dynamic Qualification of Mechanical And Electrical Equipment
- 3.11 Environmental Qualification Of Mechanical And Electrical Equipment
- 3.12 ASME Code Class 1, 2, And 3 Piping Systems, Piping Components, & Associated Supports
- 3.13 Threaded Fasteners (ASME Code Class 1, 2, and 3)
- Conclusions

Conclusions

- One (1) Departure and one (1) Exemption from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 3.
- No ASLB Contentions
- Seventy-six (76) COL Information Items are addressed in the Calvert Cliffs Unit 3 Chapter 3 FSAR.
- Sixteen (16) Request for Additional Information (RAI) responses are scheduled to be submitted.

Acronyms

- ACI – American Concrete Institute
- ACRS – Advisory Committee on Reactor Safeguards
- ASCE – American Society of Civil Engineers
- ASLB – Atomic Safety & Licensing Board
- ASME – American Society of Mechanical Engineers
- COL – Combined License
- COLA – COL Application
- EOF – Emergency Operations Facility
- EPGB – Emergency Power Generating Building
- ESWB – Essential Service Water Building
- FSAR – Final Safety Analysis Report
- HP – High Pressure
- HVAC – Heating, Ventilation, and Air Conditioning
- IBR – Incorporate by Reference
- IEEE – Institute of Electrical and Electronics Engineers
- IP – Intermediate Pressure
- ISRS – In-Structure Response Spectra
- LP – Low Pressure
- MWIS – Makeup Water Intake Structure
- NI – Nuclear Island
- PMF – Probable Maximum Flood
- PMH – Probable Maximum Hurricane
- psi – pounds per square inch
- QAPD – Quality Assurance Program Description
- RAI – Request for Additional Information
- RCOLA – Reference COL Application
- RG – Regulatory Guide
- SB – Safeguards Building
- SCC – Stress Corrosion Cracking
- SER – Safety Evaluation Report
- SPH – Standard Project Hurricane
- SSCs – Structures, Systems and Components
- SSE – Safe Shutdown Earthquake
- UFSAR – Updated Final Safety Analysis Report
- UHS – Ultimate Heat Sink

United States Nuclear Regulatory Commission

Protecting People and the Environment

Presentation to the ACRS Subcommittee

Calvert Cliffs Unit 3 Combined License Application Review

Safety Evaluation Report with Open Items

CHAPTERS 3 (Except 3.7) & 14

January 17, 2013

Order of Presentation

- **Surinder Arora** – Calvert Cliffs RCOLA Lead PM
  Overview of the Project & Review Status
- **UniStar** – RCOL Applicant
  Mark Finley will introduce the UniStar Presenters
- **Mike Miernicki**– Chapter 3 PM
  Mike will introduce the Technical Staff Presenters
- **Technical Staff Team**

Major Milestones Chronology

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

07/13/2007	Part 1 of the COL Application (Partial) submitted
12/14/2007	Part 1, Rev. 1, submitted
03/14/2008	Part 1, Rev. 2, & Part 2 of the Application submitted
06/03/2008	Part 2 of the Application accepted for review (Docketed)
08/01/2008	Revision 3 submitted
03/09/2009	Revision 4 submitted
06/30/2009	Revision 5 submitted
07/14/2009	Review schedule published
09/30/2009	Revision 6 submitted
04/12/2010	Phase 1 review completed
12/20/2010	Revision 7 submitted
03/27/2012	Revision 8 submitted
December, 2012	ACRS reviews complete for SER Chapters 2 (Part 1), 4, 5, 6, 7, 8,10, 11,12, 15, 16, 17, 18, & 19

Review Schedule (Public Milestones)

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Phase - Activity	Target Date
Phase 1 - Preliminary Safety Evaluation Report (SER) and Request for Additional Information (RAI)	April 2010
Phase 2 - SER with Open Items	TBD
Phase 3 – Advisory Committee on Reactor Safeguards (ACRS) Review of SER with Open Items	TBD
Phase 4 - Advanced SER with No Open Items	TBD
Phase 5 - ACRS Review of Advanced SER with No Open Items	TBD
Phase 6 – Final SER with No Open Items	TBD

NOTE: The target dates for Phases 2 to 6 are currently being reviewed based on the latest RAI response dates.

ACRS Phase 3 Review Plan

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

COMPLETION DATES FOR THE REMAINING FSAR CHAPTERS

Chapter	Title	Issue Date	ACRS Meeting
2 (Part 2)	Sections 2.4 & 2.5 2.4: Hydrologic Engineering 2.5: Geology, Seismology and Geotechnical Engineering	4/15/2013	To be scheduled
9	Auxiliary Systems	5/09/2013	To be scheduled
13	Conduct of Operations	TBD	To be scheduled

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Presentation to the ACRS Subcommittee

Calvert Cliffs Unit 3 Combined License Application Review

Safety Evaluation Report with Open Items

Chapter 3: Design of Structures, Components, Equipment and Systems

January 17, 2013

Staff Review Team

U.S.NRC
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- **Technical Staff**

  - **Tech Reviewer: Richard McNally**
    Branch Name: Engineering Mechanics
  - **Tech Reviewer: Yuken Wong**
    Branch Name: Engineering Mechanics
  - **Tech Reviewer: David Jeng**
    Branch Name: Structural Engineering -2
  - **Tech Reviewer: Chang-Yang Li**
    Branch Name: Balance of Plant and Technical Specifications
  - **Tech Reviewer: John Honcharik**
    Branch Name: Component Integrity
  - **Tech Reviewer: Seshagiri Tammara**
    Branch Name: Radiation Protection and Accident Consequences
  - **Tech Reviewer: Raul Hernandez**
    Branch Name: Balance of Plant and Fire Protection

Staff Review Team

U.S.NRC
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- **Technical Staff**
  - **Tech Reviewer: Renee Li**
    Branch Name: Engineering Mechanics
  - **Tech Reviewer: Eric Reichelt**
    Branch Name: Component Integrity
  - **Tech Reviewer: Sunwoo Park**
    Branch Name: Structural Engineering -2
  - **Tech Reviewer: Cheng-Ih Wu**
    Branch Name: Engineering Mechanics
  - **Tech Reviewer: Terri Spicher**
    Branch Name: Engineering Mechanics
  - **Tech Reviewer: Tuan Le**
    Branch Name: Engineering Mechanics

Staff Review Team

- **Technical Staff**
  - **Tech Reviewer: Thomas Scarbrough**
    Branch Name: Component Integrity
  - **Tech Reviewer: Pei - Ying Chen**
    Branch Name: Engineering Mechanics
  - **Tech Reviewer: Peter Kang**
    Branch Name: Electrical Engineering
  - **Tech Reviewer: Robert Hsu**
    Branch Name: Engineering Mechanics
  - **Tech Reviewer: Jim Strnisha**
    Branch Name: Component Integrity
  - **Tech Reviewer: Sardar Ahmed**
    Branch Name: Engineering Mechanics

Staff Review Team

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- **Technical Staff**
  - **Tech Reviewer: Gordon Curran**
    Branch Name: Balance of Plant and Fire Protection
  - **Tech Reviewer: Abdul Kazi**
    Branch Name: Structural Engineering - 2

- **Project Managers:**
  - **Lead PM: Surinder Arora**
  - **Chapter PM: Michael Miernicki**

Overview of COLA – Chapter 3

U.S.NRC
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SRP Section/Application Section		No. of Questions	Status Number of OI
3.2	Classification of Structures, Systems, and Components	13	1
3.3	Wind and Tornado Loadings	4	0
3.4	Water Level (Flood) Design	1	1
3.5	Missile Protection	33	3
3.6	Protection Against Dynamic Effects Associated with Postulated Rupture of Piping	2	0
3.7	Seismic Design	n/a	n/a
3.8	Design of Category I Structures	48	23
3.9	Mechanical Systems and Components	13	6
3.10	Seismic and Dynamic Qualification of Mechanical and Electrical Equipment	1	0
3.11	Environmental Qualification of Mechanical and Electrical Equipment	10	1
3.12	ASME Code Class 1, 2, and 3 Piping Systems, Piping Components, and their Associated Supports	0	0
3.13	Threaded Fasteners (ASME Code Class 1, 2, and 3)	0	0
Totals		125	35

Description of Open Items

U.S.NRC
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- RAI 358, Question No. 03.02.01-6: Requests that the applicant clarify the basis for not applying 10 CFR Appendix B to any SSC classified as Seismic Category II and clarify if this represents an exception to RG 1.29.
- RAI 356, Question No. 03.04.01-1: Requests the applicant to provide the internal flood analyses as a part of the application rather than proposing a license condition, and propose plant specific ITAAC to perform the associated walk-down verifications.
- RAI 376, Question No. 03.05.01.03-23: Requests the applicant to provide justification on how the Jaquet electronic turbine overspeed protection system reliability data would be equivalent to that provided by a different supplier, and to evaluate how the associated ITAAC commitment is impacted by a different supplier's reliability data.
- RAI 376, Question No. 03.05.01.03-24: Requests that applicant to explain how Alstom Document 75C10001 includes all the relevant information such as valve types, valve control, and overspeed protection systems etc. that is included in the U.S. EPR FSAR standard steam turbine.
- RAI 376, Question No. 03.05.01.03-25: Requests that the applicant reference all of the reports associated with the turbine missile probability analysis, probability of fatigue, and probability of destructive overspeed in the COL FSAR.

Description of Open Items

- RAI 144 , Question No. 03.08.04-2: Requests information to describe the various loadings considered for design. (See follow-up RAI 310, Question 03.08.04-27 and RAI 333, Question 03.08.04-32)

- RAI 144, Question No. 03.08.04-4: Requests information related to the waterproofing membrane system and the improved concrete mix design. (See follow-up RAI 301, Question 03.08.04-22 and RAI 333, Question 03.08.04-30)

- RAI 144, Question No. 03.08.04-7: Requests design report for all site - specific Seismic Category I structures including the buried electrical duct banks and buried piping. (See follow - up RAI 301, Question 03.08.04-23 and RAI 333, Question 03.08.04-29)

- RAI 144, Question No. 03.08.04-9: Requests to provide information on critical section design of the UHS MWIS and the buried utilities. (**Resolved**)

- RAI 144, Question No. 03.08.04-12: Requests information related to the in-service inspection requirements of concrete structures and the waterproofing membrane. (**Confirmatory**)

Description of Open Items

U.S.NRC
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- RAI 301, Question No. 03.08.04-18: Requests to provide information on load combinations, combination rules to calculate the maximum nodal accelerations and member forces in seismic analysis, and the procedure for bearing pressure calculation for the design and analysis for the Forebay and the UHS MWIS. (See follow-up RAI 339, Question 03.08.04-33)

- RAI 301, Question No. 03.08.04-20: Requests to provide information on load combinations for bearing pressure evaluation, and explain bearing capacity evaluation results for the CBIS. (See follow-up RAI 339, Question 03.08.04-34)

- RAI 301, Question No. 03.08.04-21: Requests a detailed description of the sliding analysis for each SC-I structure. The description should include the values of itemized lateral forces applied and values of itemized shear resistance

- RAI 301, Question No. 03.08.04-22: Request to address the inconsistency between CCNPP Unit 3 FSAR Rev. 7 and AREVA's RAI response/EPR FSAR Rev. 3 interim on the use of waterproofing system for Seismic Category I foundations below grade. (See follow - up RAI 333, Question 03.08.04-30).

- RAI 301, Question No. 03.08.04-23: Requests to explain the inconsistencies between FSAR Section 3.8 and FSAR Appendix 3E (with design results) on load combinations and number of critical sections for the UHS MWIS and the Forebay. (**Resolved**)

Description of Open Items

- RAI 310, Question No. 03.08.04-24: Requests to address the adequacy of critical sections considered for the design of the UHS MWIS. (**Resolved**)

- RAI 310, Question No. 03.08.04-26: Requests to explain whether the periodic monitoring program for buried concrete duct banks that may be exposed to low-pH groundwater also covers buried piping (concrete or steel) that may be exposed to low-pH groundwater. (**Confirmatory**)

- RAI 310, Question No. 03.08.04-27: Requests to explain whether all the exterior walls of UHS MWIS are subject to breaking wave pressures and revise COL FSAR Section 3.8.4.3.1 accordingly. (See follow - up RAI 333, Question 03.08.04-32)

- RAI 333, Question No. 03.08.04-29: Requests the design reports for buried duct banks and buried pipes since SC-I buried utilities are SC-I structures.

- RAI 333, Question No. 03.08.04-30: Requests to provide FSAR updates for all applicable 3.8 subsections related to the use of waterproofing and dampproofing systems.

Description of Open Items

- RAI 333, Question No. 03.08.04-31: Requests to clarify that the discussion in the proposed markup for Section 3.8.4.7, regarding the description of the periodic inservice testing of buried piping using flow or pressure, is for all buried piping. **(Confirmatory**)

- RAI 333, Question No. 03.08.04-32: Requests additional information to justify the assumption that only the East Wall of the UHS MWIS is subject to breaking wave pressure. Requests information on the consideration of the run-up water elevation in the design of the exterior walls of the UHS MWIS

- RAI 339, Question No. 03.08.04-33: Requests the technical basis that the CCNPP method to determine the design member forces due to seismic loads is at least as conservative as the U.S. EPR method or more detailed methods

- RAI 339, Question No. 03.08.04-34: Requests the values of the maximum pressures considering all locations of the CBIS basemat design, explanation on how these pressures are obtained, and explanation whether the CCNPP Unit 3 bearing capacities provided in the FSAR Revision 7 are the bearing capacities for localized pressure.

Description of Open Items

- RAI 145, Question No. 03.08.05-2: Requests additional information about the site-specific differential settlement evaluation performed for the NI common basemat structure. (See follow-up RAI 308, Question 03.08.05-8)
- RAI 145, Question No. 03.08.05-4: Requests to provide a complete description and the results of the stability evaluations for the NI, EPGBs, and ESWBs. (See follow-up RAI 308, Question 03.08.05-9)
- RAI 308, Question No. 03.08.05-8: Requests to explain how the new and updated COL Items regarding settlement of the NI common basemat structure will be addressed and what site-specific conditions will be considered.
- RAI 308, Question No. 03.08.05-9: Requests to explain how the new and updated COL Items regarding settlement of the EPGBs and the ESWBs will be addressed and what site-specific conditions will be considered. Also requests to provide additional information on the methodology and procedures used for the settlement evaluation of the CBIS foundation.

Description of Open Items

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- RAI 352, Question No. 03.09.01-2: Requests the applicant to confirm whether the new supplemental computer programs now listed in the COL FSAR were previously reviewed and approved by NRC, and if not to provide the verification and validation documentation for these codes.

- RAI 362, Question No. 03.09.03-2: Requests the applicant to prepare the design specifications and design reports for ASME Code Class 1, 2, and 3 components, piping supports, and core support structures that comply with and are certified to the requirements of ASME Code, Section III.

- RAI 363, Question No. 03.09.03-3: Requests the applicant provide site specific ITAAC for a list of detailed component design information requested by the staff that is not available at this stage of the component design.

- RAI 364, Question No. 03.09.03-4: Requests that the applicant provide site specific ITAAC to report the results of inspections required by NRC Bulletin 79-13.

- RAI 355, Question No. 03.09.05-1: Requests the applicant to provide a summary of certain plant specific reactor core support structure and internals design information.

Description of Open Items

- RAI 46, Question No. 03.09.06-1: Requests the applicant to fully describe functional design and qualification, and inservice testing programs for pumps, valves, and dynamic restraints including example descriptions of component qualification.
- RAI 302, Question No. 03.11-7: Requests the applicant to describe the process for implementation of environmental qualification (EQ) provisions in U.S.EPR FSAR.

Technical Topics of Interest
3.8 Design of Cat. I Structures

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3.8.4 Other Seismic Category I Structures - Design and Analysis Procedures, Loads

Issues Identified

- Insufficient design information for site-specific Seismic Category-I structures
- Insufficient site-specific load information for establishing the design-basis loads

Staff Evaluation

- Applicant provided in updated FSAR with acceptable design information for UHS Makeup Water Intake Structure and Forebay
- Applicant is yet to provide comparable design information for Buried Duct Banks and Pipes **(Open Item)**
- Applicant identified and incorporated all applicable loads into the design-basis loads (site-specific wind, hydrostatic/hydrodynamic, snow/ice, etc.)

Note: Site-specific SC-I structures at CCNPP3: UHS MWIS, Forebay, and Buried electrical duct banks and pipes

Technical Topics of Interest
3.8 Design of Cat. I Structures

United States Nuclear Regulatory Commission
Protecting People and the Environment

<u>3.8.4 Other Seismic Category I Structures</u> - Materials (protection from adverse subsurface environment)

Issues Identified

- Insufficient data to establish subsurface adverse conditions at CCNPP3
- Insufficient information on protection of below-grade concrete structures from adverse environment - brackish water and aggressive groundwater
- Lack of technical details on waterproofing system

Staff Evaluation

- Applicant provided information necessary to determine adverse soil/groundwater conditions for the site (pH, sulfate/chloride concentrations)
- Protective measures and design are identified and described – waterproofing system design, concrete mix design, replacement of adverse soils with non-adverse backfill

Technical Topics of Interest
3.8 Design of Cat. I Structures

3.8.4 Other Seismic Category I Structures - Testing and In-Service Surveillance Programs

Issues Identified

- Insufficient information on testing and in-service inspection program for SC-I structures subjected to adverse subsurface environment

Staff Evaluation

FSAR is adequately revised to include information on testing and in-service inspection:

- For below - grade concrete beneath aggressive low - pH groundwater table, water collected by the waterproofing geomembrane system will be monitored,
- Groundwater level in the powerblock area will be monitored,
- Buried concrete duct banks exposed to low pH groundwater will be inspected periodically, and
- ISI program for buried pipes will be supplemented with periodic in-service testing

Technical Topics of Interest
3.8 Design of Cat. I Structures

United States Nuclear Regulatory Commission
Protecting People and the Environment

3.8.5 Foundations - Stability Analysis

Issues Identified

FSAR did not provide sufficient information on sliding stability analysis:

- Potential sliding interfaces not fully identified and described
- Insufficient information on the values and determination of friction coefficient for different interfaces

Staff Evaluation

- Potential sliding interfaces identified and corresponding friction coefficients provided. Interfaces consist of different material surfaces including soil, concrete, mudmat, and waterproofing membrane.
- Applicant specified a vendor testing program to verify coefficient of friction for waterproofing membrane prior to construction, with corresponding ITAAC commitment established
- The applicant will provide detailed information on sliding analysis for each SC-I structure **(Open Item)**

Technical Topics of Interest
3.8 Design of Cat. I Structures

U.S.NRC
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3.8.5 Foundations - Differential Settlement

Issues Identified

- Insufficient information on assessment of the impact of differential settlements on the design basis loads
- Inadequate information on developing site-specific settlement profiles (based on site-specific soil conditions and actual construction sequence) and their reconciliation with EPR settlement profiles.

Staff Evaluation

- Staff finds the following remain **Open Items**:
- FSAR is to be updated to include adequate information on site-specific settlement assessment for SC-I structures and its reconciliation with EPR
- Applicant will clarify how the site-specific subsurface conditions are considered, including the effect of lateral variation of soil properties within each subsurface stratum
- Applicant will ascertain that the proposed settlement monitoring program is capable of providing differential settlement contours comparable to those of EPR.

ACRONYMS

U.S.NRC
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- COL - Combined License
- FSAR - Final Safety Analysis Report
- ITAAC - Inspections, Tests, Analyses, and Acceptance Criteria
- NI - Nuclear Island
- EPGB - Emergency Power Generating Buildings
- ESWB - Essential Service Water Buildings
- CBIS - Common Basemat Intake Structure
- UHS MWIS - Ultimate Heat Sink Makeup Water Intake Structure
- CWS MWIS - Circulating Water System Makeup Water Intake Structure
- PMH - Probable Maximum Hurricane
- SPH - Standard Project Hurricane
- CS - Conventional Seismic
- CCNPP – Calvert Cliff Nuclear Power Plant

UNISTAR NUCLEAR ENERGY

Presentation to ACRS
U.S. EPR^{TM} Subcommittee
Calvert Cliffs Nuclear Power Plant Unit 3
FSAR Chapter 14, Verification Programs
January 17, 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 14, Verification Programs occurred on February 23, 2012.

Introduction

- No Departures and no Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 14.
- No ASLB Contentions
- Sixteen (16) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 14.

Introduction

- Today Mark Finley, UniStar Senior Vice President, Regulatory Affairs & Engineering, will present the Calvert Cliffs Unit 3 FSAR Chapter 14.
- Today's Presentation was prepared by UniStar and is supported by:
  - John Volkoff, UniStar – Licensing Engineer, ITAAC
  - Mark Hunter, UniStar – Director Operations and Maintenance
- The focus of today's presentation will be on site-specific information that supplements the U.S. EPR FSAR.

Chapter 14, Verification Programs
Agenda

- 14.1 Specific Information to be Addressed for the Initial Plant Test Program
- 14.2 Initial Plant Test Program
  - COL Information Items/Supplemental Information
- 14.3 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)
  - COL Information Items/Supplemental Information
- Conclusions

14.1 SPECIFIC INFORMATION TO BE ADDRESSED FOR THE INITIAL PLANT TEST PROGRAM

(This section of the U.S. EPR is Incorporated by Reference)

14.2 INITIAL PLANT TEST PROGRAM

Verification Programs
COL Information Items

- A COL applicant will describe the organizational units that manage, supervise, or execute any phase of the test program. The COL applicant should also describe how, and to what extent, the plant's operating and technical staff participates in each major test phase.

<u>Startup Organization</u>

- The organizational units with roles in the Calvert Cliffs Unit 3 startup organization include the UniStar Nuclear Energy (UNE) startup organization, the Project Delivery and UniStar Nuclear Operating Services, LLC.
  - The corporate startup organization is led by the Vice President - Startup, Testing, and Commissioning.
  - The Unit 3 site organization is led by the Site Commissioning Manager who reports to the corporate Manager of Commissioning Integration.
  - The Manager of Commissioning Integration reports to the Vice President - Startup, Testing, and Commissioning.
  - The UNE Startup, Testing, and Commissioning organization has an oversight role for the initial startup test program.
- The Project Delivery Consortium has the responsibility to develop, manage, and execute the initial startup test program.
- UniStar Nuclear Operating Services, LLC participates as a member of the Test Review Team (TRT) and in the operation of plant equipment.

Verification Programs
Supplemental Information

- Supplemental Section 14.2.1

<u>Turnover of Systems to Startup Organization</u>

- Official turnover of systems or portions of systems from the construction organization to the startup organization is controlled by site-specific administrative procedures. The administrative procedures:
  - Require components within the turnover boundary to be clearly designated,
  - Require a review of construction activities to ensure that required construction activities with the turnover boundary are completed, or require identification of any incomplete construction activities,
  - Require formal acceptance and turnover approval by the Site Commissioning Manager; and
  - Establish controls to prevent unauthorized construction work activities within the turnover boundary to prevent potential safety issues.

Verification Programs
COL Information Items

- A COL applicant will provide site-specific information for review and approval of test procedures.

<u>Test Procedure Preparation and Execution</u>

➢ Procedures ensure that the design bases attributes are verified by field measurements
  - Using references provided by
    - ✓ Appropriate design and vendor organizations,
    - ✓ U.S. EPR FSAR
    - ✓ Calvert Cliffs Unit 3 FSAR
    - ✓ Technical Specifications
    - ✓ Applicable Regulatory Guides
  - Ancillary Data
    - ✓ Useful to recreate the test conditions or for trending
    - ✓ Not used to determine component or system performance
    - ✓ Examples include oil temperature, weather conditions and general observations.

Verification Programs
COL Information Items

- A COL applicant will provide site-specific information for review and approval of test procedures.

Test Procedure Preparation and Execution (continued)

- Test Review Criteria
  - ✓ Based on differences between calculations and measurements
  - ✓ More conservative than the Safety Analysis
- Acceptance criteria
  - ✓ Linked directly to the Safety Analysis or
  - ✓ Related assumptions

Verification Programs
COL Information Items

- A COL applicant will plan, and subsequently conduct, the plant startup test program.

<u>Conduct of Test Program</u>

- ➢ The initial test program will be planned and conducted by the startup test group and will be controlled by administrative procedures and requirements

Verification Programs
COL Information Items

- A COL applicant will address the site-specific administrative procedures for review and approval of test results.

Test Review Team

➢ Test Review Team (TRT)
  - TRT Chairman - appointed by Site Commissioning Manager
  - Project Delivery Consortium Representative
  - Engineering Department Representative
  - Operating Department Representative
  - Members are chosen to provide subject-matter expertise in specific testing phases.
  - Augmented as necessary with additional expertise
  - TRT membership is increased prior to low power physics testing by adding:

    Plant General Manager, Engineering Manager, Operations Manager, and Maintenance Manager

Verification Programs
COL Information Items

- A COL applicant will address the site-specific administrative procedures for review and approval of test results.

<u>Test Review Team (continued)</u>

➢ TRT Functions

- Evaluates adequacy of startup test procedures prior to test
- Reviews completed startup test results and verifies that field revisions did not compromise the intent of the procedure
- Assures that plant testing documents that the design objectives are met
- Verifies that the test results that do not meet acceptance criteria are entered into the corrective action program
- Confirms that retests are performed as required prior to proceeding to the next phase
- Ensures that the justification for test deferral requests include a schedule for their performance
- Maintains records of ITAAC reviews and ensures that work is performed prior to proceeding to the next testing Phase
- Issues a formal recommendation to proceed to the next testing phase

Verification Programs
COL Information Items

- A COL applicant will address the site-specific administrative procedures for review and approval of test results.

Procedure Review and Evaluation

- Test Results
  - Reviewed and approved by the startup organization supervision prior to presenting the results to the TRT
  - Compared to specific acceptance criteria for determining the success or failure of a test are included as part of its procedure.
  - Evaluated by Engineering if acceptance criteria are not met.
  - Submitted to TRT with completed procedure and test report for final review, evaluation and approval recommendation, including any completed engineering evaluations.

Verification Programs
COL Information Items

- A COL applicant will address the site-specific administrative procedures for review and approval of test results.

Test Expectations

- Test Phases
  - Phase I - Preoperational Testing
  - Phase II - Initial Fuel Loading and Pre-Criticality Testing
  - Phase III - Initial Criticality and Low Power Physics Testing
  - Phase IV - Power Ascension Testing (Plateaus 5%, 25%, 50%, 75%, >98%)
- TRT review of test results is performed to determine acceptability to proceed to next plateau
  - Justification is developed for proceeding with any core anomalies or plant stability issues prior to proceeding to a higher power level.
  - Test results for tests involving plant transients are compared to results of the realistic analysis and the model is revised if necessary.

Verification Programs
COL Information Items

- A COL applicant will address the site-specific administrative procedures for review and approval of test results.

Test Expectations (Continued)

- Compares measured plant parameters against predicted plant parameters
  - ✓ If any limits (regulatory or administrative) could be exceeded prior to reaching the next plateau, testing will be suspended before proceeding to the power level.
  - ✓ Corrective actions will then be implemented and reviewed by the TRT prior to allowing testing to continue.
- Examples of limits monitored are as follows:
  - ✓ Radiation Safety Limits (10 CFR Part 20 and Part 50.36a)
  - ✓ Liquid and Gaseous Effluents (Part 50 Appendix I)
  - ✓ Offsite Release Limits (thermal, chemical, etc.)
  - ✓ Grid Stability (voltage, frequency, etc.)
- Completion of testing at 100% of rated power
  - ✓ Final test results reviewed, evaluated and approved.

Verification Programs
COL Information Items

- A COL applicant will develop a test program that considers the stated guidance components.

<u>Test Program Schedule</u>

➢ A site-specific test program will be developed that considers:
  - Adequate time and requirements to conduct/transition through the different phases of test and fuel loading
  - Impact of untested Structures, Systems, and Components (SSCs) and completion of Technical Specification Surveillance
  - Availability of test procedures for NRC review
  - Completion of ITAACs prior to fuel load

Verification Programs
COL Information Items

- A COL applicant will provide site-specific test abstract information.

<u>Individual Test Descriptions</u>

➢ Site-specific test abstract information for the site-specific systems

- A typical test abstract for the site-specific systems includes the following:
    - ✓ OBJECTIVES
    - ✓ PREREQUISITES
    - ✓ TEST METHOD
    - ✓ DATA REQUIRED
    - ✓ ACCEPTANCE CRITERIA

Verification Programs
COL Information Items

- A COL applicant will either perform the natural circulation test (Test # 196) or provide justification for not performing the test.

<u>Individual Test Descriptions</u>

- The natural circulation test (Test #196) will be performed or justification will be provided for not performing the test.
- The need to perform the test will be based on evaluation of previous natural circulation test results and a comparison of reactor coolant system (RCS) hydraulic resistance coefficients applicable to normal flow conditions.

Verification Programs
COL Information Items

- A COL applicant that references the U.S. EPR design certification will identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1.

Trial Use of Plant Operating and Emergency Procedures

- ➢ Specific operator training and participation, as described in the U.S. EPR FSAR Section 14.2.9, will be conducted.

14.3 INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

(ITAAC)

Verification Programs
COL Information Items

- A COL applicant will provide ITAAC for emergency planning, physical security, and site-specific portions of the facility that are not included in Tier 1 ITAAC.

INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA (ITAAC)

➢ ITAAC sets (Total: 1521) consist of:
  - Design Certification ITAAC (DC-ITAAC) (1275)
  - COLA ITAAC (246)
    - Site Specific system ITAAC (SS-ITAAC)
    - Emergency Planning ITAAC (EP-ITAAC)
    - Physical Security ITAAC (PS-ITAAC)

Verification Programs
COL Information Items

- A COL applicant will describe the selection methodology for site-specific SSC included in ITAAC, emergency planning and physical security hardware.

INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

- ➢ Methodology for site-specific SSC to be included in ITAAC
  - SS-ITAAC
    - ✓ ITAAC are provided for SSCs not in the U.S. EPR for
      - U.S. EPR Interface Requirements
      - Systems, Structures and Components (SSCs) that meet screening criteria
      - ITAAC are selected using criteria and methodology in the U.S. EPR FSAR, Section 14.3.2
      - Features, SSCs, and Interface Requirements described in COLA Tables 14.3-1, 14.3-2, and 14.3-3

Verification Programs
COL Information Items

- A COL applicant will describe the selection methodology for site-specific SSC included in ITAAC, emergency planning and physical security hardware.

INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

- PS-ITAAC
  - ✓ Selected based on NUREG - 0800, Standard Review Plan, 14.3.12, Physical Security Hardware – Inspections, Tests, Analyses, and Acceptance Criteria, Revision 1 – May 2010
  - ✓ ITAAC in both U. S. EPR Tier 1 and COLA
  - ✓ ITAAC not in U. S. EPR Tier 1 are added to COLA
- EP ITAAC
  - ✓ Selected based on ITAAC provided in SRM-SECY-05-0197
  - ✓ Only site-specific

Verification Programs
COL Information Items

- A COL applicant will describe the selection methodology for site-specific SSC included in ITAAC, emergency planning and physical security hardware.

<u>INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA</u>

- Table 14.3-1 - Site Specific Analyses (Safety Significant Features)
  - Expert Panel reviewed site-specific safety-significant features that are credited in the site-specific analyses that needed to be addressed by ITAAC.
- Table 14.3-2 - Site Specific SSC ITAAC Screening Summary
  - Expert Panel reviewed site-specific safety-significant features (SSCs) and selected components that needed to be addressed by ITAAC.
- Table 14.3-3 - Interface Requirements Screening Summary
  - Expert Panel reviewed general interface requirements specified in U.S. EPR FSAR.

Verification Programs
COL Information Items

- The plan for implementing the Piping DAC will addressed by the COL applicant.

INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

- Piping Design Acceptance Criteria (DAC)
  - The plan for implementing the Piping DAC will identify
    - ✓ Evaluations that will be performed,
    - ✓ Schedule for performing these evaluations, and
    - ✓ Associated design processes and information that will be available to the NRC for audit.

Chapter 14, Verification Programs
Agenda

- 14.1 Specific Information to be Addressed for the Initial Plant Test Program
- 14.2 Initial Plant Test Program
  - COL Information Items/Supplemental Information
- 14.3 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)
  - COL Information Items/Supplemental Information
- Conclusions

Conclusions

- No Departures or Exemptions from the U.S. EPR FSAR for Calvert Cliffs Unit 3, Chapter 14.
- No ASLB Contentions
- Sixteen (16) COL Information Items, as specified by U.S. EPR FSAR, are addressed in Calvert Cliffs Unit 3 FSAR Chapter 14.
- All Request for Additional Information (RAI) responses have been submitted.

Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- ASLB – Atomic Safety & Licensing Board
- CFR – Code of Federal Regulation
- COL – Combined License
- COLA – COL Application
- DAC – Design Acceptance Criteria
- DC – Design Certification
- EP – Emergency Planning
- FSAR – Final Safety Analysis Report
- IBR – Incorporate by Reference
- ITAAC – Inspections, Tests, Analysis, & Acceptance Criteria
- NRC – Nuclear Regulatory Commission
- PS – Physical Security
- RAI – Request for Additional Information
- RCOLA – Reference COL Application
- RCS – Reactor Coolant System
- RG – Regulatory Guide
- SER – Safety Evaluation Report
- SME – Subject Matter Expert
- SS – Site Specific
- SSCs – Structures, Systems and Components
- TMI – Three Mile Island
- TRT – Test Review Team
- UNE – UniStar Nuclear Energy

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United States Nuclear Regulatory Commission

Protecting People and the Environment

Presentation to the ACRS Subcommittee

UniStar Nuclear Energy Combined License Application Review
Calvert Cliffs Nuclear Power Plant, Unit 3
Safety Evaluation Report with Open Items

Chapter 14: “Verification Programs”

January 17, 2013

Staff Review Team

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- **Technical Staff**
  - **Technical Reviewer Name:** Samantha Crane
    Branch Name: Mechanical Vendor Branch
  - **Technical Reviewer Name:** Edmund Kleeh
    Branch Name: ITAAC Branch
  - **Technical Reviewer Name:** Sunwoo Park
    Branch Name: Structural Engineering Branch
  - **Technical Reviewer Name:** Yiu Law
    Branch Name: Engineering Mechanics Branch
  - **Technical Reviewer Name:** John Budzynski
    Branch Name: Reactor Systems Branch
  - **Technical Reviewer Name:** Deirdre Spaulding
    Branch Name: Instrumentation, Controls & Electrical Engineering Branch
  - **Technical Reviewer Name:** Peter Kang
    Branch Name: Electrical Engineering Branch

Staff Review Team (cont.)

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- **Technical Reviewer Name:** Tarico Sweat
  Branch Name: Balance of Plant Branch
- **Technical Reviewer Name:** Jean-Claude Dehmel
  Branch Name: Radiation Protection & Accident Consequences Branch
- **Technical Reviewer Name:** James Bongarra
  Branch Name: Operator Licensing & Human Performance Branch
- **Technical Reviewer Name:** Anthony Bowers
  Branch Name: New Reactor Licensing Branch
- **Technical Reviewer Name:** Anne-Marie Grady
  Branch Name: Containment & Ventilation Branch
- **Technical Reviewer Name:** Pete Lee
  Branch Name: Reactor Security Licensing Branch

- **Project Managers**
  - Lead: Surinder Arora
  - Chapter 14: David Jaffe and Tanya Ford

Overview of COL Application

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SRP Section/Application Section		No. of Questions	Status Number of OI
14.1	Specific Information for the Initial Plant Test Program	0	0
14.2	Initial Plant Test Program	60	3
14.3	Inspections, Tests, Analyses, and Acceptance Criteria	0	0
14.3.1	Selection Criteria and Methodology	45	2
14.3.2	Structural and Systems Engineering	20	1
14.3.3	Piping Systems and Components	5	2
14.3.4	Reactor Systems	0	0
14.3.5	Instrumentation and Controls	0	0

Overview of COL Application (cont.)

SRP Section/Application Section		No. of Questions	Number of OI
14.3.6	Electrical Systems	2	0
14.3.7	Plant Systems	1	0
14.3.8	Radiation Protection	0	0
14.3.9	Human Factors Engineering	0	0
14.3.10	Emergency Planning	3	0
14.3.11	Containment Systems	0	0
14.3.12	Physical Security Hardware	8	0
	TOTAL	**146**	**8**

ACRS Staff Presenters

Presenter	Section
David Jaffe	14.0
Samantha Crane	14.2
Edmund Kleeh	14.3.1
Sunwoo Park	14.3.2
Yiu Law	14.3.3

Note: The remaining staff reviewers are available to address questions related to the other Chapter 14 sections.

14.2 – Initial Plant Test Program Open Items

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- **Open Item 1:** Follow-up Request for Additional Information (RAI) 337, Question 14.02-58, relates to the site specific test abstract for the Ultimate Heat Sink (UHS) Make-up Water System. The applicant informed the staff of their intent to redesign aspects of the UHS system design. The staff is currently reviewing the applicant's response.

- **Open Item 2:** RAI 373, Question 14.02-59 relates to the site specific test abstract for the Essential Service Water System. The staff is currently reviewing the applicant's response.

- **Open Item 3:** RAI 374, Question 14.02-60 relates to the inclusion of standard language for initial test program (ITP) license conditions. This issue is identified as an open item in the safety evaluation report (SER), but has since been resolved and closed.

14.2 – Technical Topics of Interest

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- The staff reviewed the following Calvert Cliffs Nuclear Power Plant Unit 3 (CCNPP3) Combined License (COL) site specific preoperational and startup tests provided in the Final Safety Analysis Report (FSAR):
  - ♦ FSAR Section 14.2.14.1, “Raw Water Supply System”
  - ♦ FSAR Section 14.2.14.2, “Ultimate Heat Sink (UHS) Makeup Water System”
  - ♦ FSAR Section 14.2.14.3, “Essential Service Water Blowdown System”
  - ♦ FSAR Section 14.2.14.4, “Essential Service Water Chemical Treatment System”
  - ♦ FSAR Section 14.2.14.5, “Waste Water Treatment Plant”
  - ♦ FSAR Section 14.2.14.6, “Fire Water Supply”
  - ♦ FSAR Section 14.2.14.7, “Circulating Water Supply System”
  - ♦ FSAR Section 14.2.14.8, “UHS Makeup Water Intake Structure Ventilation System”
  - ♦ FSAR Section 14.2.14.9, “UHS Electrical Building Ventilation System”
  - ♦ FSAR Section 14.2.14.10, “Cooling Tower Acceptance”
  - ♦ FSAR Section 14.2.14.11, “Plant Laboratory Equipment”
  - ♦ FSAR Section 14.2.14.12, “Portable Personnel Monitors and Radiation Survey Instruments”
  - ♦ FSAR Section 14.2.14.13, “UHS Makeup Water Intake Structure and UHS Electrical Building Communications System”

14.2 – Technical Topics of Interest (cont.)

- The staff evaluated the following COL Information Items:
  - COL Information Item No. 14.2-1 for organization and staffing
  - COL Information Item No. 14.2-2 for the test program and schedule
  - COL Information Item No. 14.2-3 for review and approval of test procedures
  - COL Information Item No. 14.2-4 for review and approval of test results
  - COL Information Item No. 14.2-5 for the circulating water supply system test
  - COL Information ItemCOL Information Item No. 14.2-6 for the natural circulation test
  - No. 14.2-7 for the cooling tower test
  - COL Information Item No. 14.2-8 for the raw water supply system test
  - COL Information Item No. 14.2-9 for the personnel radiation monitors test
  - COL Information Item No. 14.2-10 for planning and conducting the startup test program
  - COL Information Item No. 14.2-11 for operator training to satisfy TMI Action Plan Item I.G.1

14.2 – Conclusions

- The staff issued 60 RAIs that resulted in changes by the COL applicant to the administrative controls for the test program, site specific test abstracts, and proposed COL license conditions. The staff evaluated these changes and, with the exception of two open items, find them acceptable.

- The staff is evaluating the response to two RAIs. Both RAIs are currently being tracked as open items.

14.3.1 – Selection Criteria and Methodology

- According to Regulatory Issue Summary (RIS) 2008-05, Revision 1, “Lessons Learned to Improve Inspections, Tests, Analyses, and Acceptance Criteria [ITAAC] Submittal,” the staff has identified five general categories in which ITAAC submittals could be improved:
  - ITAAC format and content
  - ITAAC nomenclature and language
  - ITAAC focus, logic, and practicality,
  - ITAAC standardization and consistency
  - ITAAC scope

14.3.1 – Open Items

- The staff identified inspectability issues with Calvert Cliffs' site specific ITAAC. RAI 360 and RAI 361 are being tracked as open items to resolve inspectability issues.
- RAI 360 has13 open issues:
  - 5 – Inspection Focus, Logic, and Practicality
  - 5 – Nomenclature and Language
  - 1 – Format and Content
  - 1 – Standardization and Consistency
  - 1 – Scope

14.3.1 – Open Items (cont.)

- RAI 361 has 18 open issues:
  - 7 – Inspection Focus, Logic, and Practicality
  - 1 – Nomenclature and Language
  - 0 – Format and Content
  - 9 – Standardization and Consistency
  - 1 – Scope
- The staff has reviewed the applicant's responses to both RAIs and have addressed them by their own comments which the staff are now reviewing.

14.3.2 – Structural and Systems Engineering Open Item

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- **Open Item RAI 367, Question 14.03.02-20 is related to Seismic Category (SC) II Structures and Seismic II/I Interactions:**
  - SRP provides guidance that ITAAC should be established to verify that failure of non-Seismic Category I systems, structures, and components (SSCs) will not impair the safety capability of nearby safety-related SSCs (II/I interactions).
  - Interface requirements contained in the U.S. EPR FSAR (Tier1, Section 4) must be met by the COL applicant by providing design information and ITAAC.
  - To address interface requirements for SC-II structures, CCNPP3 committed in FSAR Table 14.3-3 to provide design information that demonstrates prevention of II/I interactions (SC-II structures will be designed to the requirements of SC-I).
  - The COL applicant is to provide committed information in the updated FSAR.

14.3.3 – Piping Systems and Components Open Items

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- **Open Item 1:** RAI 161, Question 14.03.03-02

  Technical Issue

  ♦ For clarity and inspectability, the staff determined that three ITAAC covering 1) design, 2) fabrication and installation, and 3) as-built reconciliation are necessary and sufficient to ensure the piping systems and components are properly designed and constructed in accordance with the ASME Code Section III requirements.

  Staff Evaluation

  ♦ For the UHS Makeup Water System, there are only two ITAAC to address the 3 items above. The applicant combined the fabrication/installation and as-built reconciliation into one ITAAC.

14.3.3 – Open Items (cont.)

- **Open Item 1:** RAI 161, Question 14.03.03-02

  Staff Evaluation (cont.)

  - For component design ITAAC, an inspection to verify the existence of the ASME Code Section III design report is inappropriate. The content of the report should be the focus of the inspection, not simply the fact that it exists.
  - For piping system reconciliation ITAAC, the statement “Piping, including supports, analyzed using time history methods will be reconciled to the as-built information” is misleading because it restricts the piping systems only to those analyzed using time history methods.

14.3.3 – Open Items (cont.)

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- **Open Item 2:** RAI 374, Question 14.03.03-05

  Technical Issue

  ♦ For the Fire Protection Building Ventilation System, an ITAAC to ensure that the Seismic Category II equipment and piping systems can withstand seismic design basis loads without impacting the capability of equipment designated as Seismic Category I from performing its safety function is needed.

  Staff Evaluation

  ♦ In the applicant's response, instead of addressing Seismic Category II equipment and piping systems, the applicant used the term "Conventional Seismic" and explained that RAI 253, Question 03.07.02-45 detailed the various equipment which consists of the Fire Protection Building Ventilation System. RAI 253, Question 03.07.02-45 is being resolved by the Structural Engineering Branch and no conclusion has been reached at this point.

Acronyms

ACRS	Advisory Committee on Reactor Safeguards
ASME	American Society of Mechanical Engineers
CCNPP3	Calvert Cliffs Nuclear Power Plant Unit 3
COL	Combined License
U.S. EPR	United States Evolutionary Pressurized Reactor
FSAR	Final Safety Analysis Report
ITAAC	Initial Tests, Analyses, and Acceptance Criteria
ITP	Initial Test Program
NRC	Nuclear Regulatory Commission
RAI	Requests for Additional Information
RIS	Regulatory Issue Summary
SER	Safety Evaluation Report
SC-I	Seismic Category I
SC-II	Seismic Category II
SSCs	Systems, Structures, and Components
UHS	Ultimate Heat Sink