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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARD

(ACRS)

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SUBCOMMITTEE ON AP1000

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OPEN SESSION

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TUESDAY

FEBRUARY 2, 2010

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ROCKVILLE, MARYLAND

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

SUBCOMMITTEE MEMBERS:

HAROLD B. RAY, Chair

SAID ABDEL-KHALIK

J. SAM ARMIJO

SANJOY BANERJEE

DENNIS C. BLEY

MARIO V. BONACA

CHARLES H. BROWN, JR.

MICHAEL T. RYAN

SUBCOMMITTEE MEMBERS (Cont'd):

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JOHN W. STETKAR

CONSULTANTS TO THE SUBCOMMITTEE:

THOMAS S. KRESS

GRAHAM B. WALLIS

NRC STAFF:

PETER WEN, Designated Federal Official

WEIDONG WANG

STEPHANIE COFFIN

TERRI SPICHER

JERRY CHUANG

JOHN HONCHARIK

RENEE LI

EILEEN McKENNA

TOM SCARBROUGH

TANYA SIMM

JEFF POEHLER

GORDON CURRAN

THINH DINH

GREGORY MAKAR

PATRICK DONNELLY

PHYLLIS CLARK

GENE HSII

JOE DONOGHUE

TANYA FORD

MICHELLE HART

ALSO PRESENT:

AMY AUGHTMAN

ED CUMMINS

EDDIE GRANT

BRET COLLIER

BOB HIRMANPOUR

GARY CANTNER

ROB SISK

GREGORY MEYER

ALLEN McDONALD

CESARE FREPOLI

ED THROM

C-O-N-T-E-N-T-S

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

(8:30 a.m.)

CHAIR RAY: The meeting will now come to order.

This is the first day of a two-day meeting of the AP1000 Reactor Subcommittee, a standing subcommittee of the Advisory Committee on Reactor Safeguards.

I'm Harold Ray, chairman of the subcommittee, ACRS members in attendance are Michael Ryan, Charles Brown, Dennis Bley. Not yet Dr. Shack. Mario Bonaca, Sam Armijo, John Stetkar, Said Abdel-Khalik, Sanjoy Banerjee.

Did I miss any member?

Our ACRS consultants are Tom Kress and Graham Wallis, and they are also present. Peter Wen is the designated federal official for this meeting, and he is joined by ACRS staff member Weidong Wang.

The purpose of this subcommittee meeting over the next two days will be to continue our reviews and discussions concerning the Design Control Document Revision 17 of the AP1000 Pressurized Water Reactor, and standard contents of the Referenced

Combined Operating License Application.

Let me pause in my prepared remarks here to say this now restores the combined license review to our agenda. We had one meeting, one two-day meeting in July in which we were reviewing 10 chapters of both the DCD and the combined license application.

We then devoted the next two-day meeting to the DCD Amendment itself, alone. We will now, because we have the opportunity to do so, begin to pick up just the standard content portion of the combined license application, and the presentations on our agenda who the applicant in that instance as NuStart. In fact it will be as the handout show Southern Company representing NuStart in those presentations.

So we're giving the first priority in our efforts to the DCD Amendment, but as time has now permitted us to do, resuming review of the Combined Operating License.

Okay, returning then to my prepared remarks, we had three two-day AP1000 meetings in July, October and November last year, as I said. And in that July meeting we, as I also said, reviewed both the applications, except for DCD Section 2.7, 3.8 and Chapter 6, this February meeting will complete the

initial reviews of the SER with Open Items for both the DCD and the Combined License reviews.

Having said that it's more important than perhaps it would have been previously that as part of this two-day meeting we also scrub our action item list, because that will drive the agenda for our subsequent meetings in order to make sure that we address all of the members' concerns, and request for additional discussion in this first go-round with open items.

So we've put time on the agenda for that, at the end of the second day. Sanjoy, because you won't be here the second day I'd like to make sure we have your action items done, reviewed, today as part of the ending discussion we'll be having today, because it's important that we have clarity around what issues we need further discussion on in this phase of the work.

We will hear presentations from NRC staff, Westinghouse, Southern Nuclear Operating Company, and NuStart, my remarks say. I take it that Southern Company and NuStart are going to be one and the same in this case but we'll see.

We've received no written comments or requests for time to make oral statements from members

of the public regarding today's meeting. As shown in the agenda, this meeting will review AP1000 DCD Chapter 15 and Combined License for Chapters 3, 9,3 13, 15 and the open issues that were identified in prior meetings which are on the agenda for discussion today.

We will follow the standard briefing template that we have in the past consisting of two elements: a discussion of the DCD or combined license by representatives of applicants; and a discussion of the draft safety evaluation report with open items prepared by the NRC staff and made available to the members.

The agenda also indicates that portions of the meeting may include design information that is considered to be proprietary or security-related. And these portions when they occur will be closed to the public; attendance in those portions of the meetings dealing with such information will be limited to the NRC staff and its consultants, Westinghouse representatives, Southern Nuclear Operating Company, NuStart, and those individuals and organizations who have entered into appropriate confidentiality agreements with them.

Consequently we'll need to confirm at that

time that we have only eligible observers and participants in the room for the closed portion.

We have, I understand, several people on the phone, bridge lines, listening to the discussions. To preclude interruption of the meeting, the phone line is placed in a listen-in mode.

The Subcommittee will gather information, analyze relevant information and facts, and formulate proposed positions and actions as appropriate for deliberation by the full committee.

Proposed participation in today's meeting has been announced as part of the notice of the meeting which has been published in the Federal Register. A transcript is being kept, and will be made available as stated in the notice.

Therefore we request participants in this meeting to use microphones located throughout the meeting room in addressing the subcommittee. Participants should first identify themselves and speak with sufficient clarity and volume so that they may be readily heard.

At this time I'd turn to Said for comments concerning information that was in the conflict of interest notice.

MEMBER ABDEL-KHALIK: Thank you, Mr.

Chairman.

I have an organizational conflict with the applicant, Vogtle R-COLA. Therefore, I will not participate in discussions related to the R-COLA, and will limit my participation to discussions related to the DCD.

CHAIR RAY: Okay, thank you, sir.

With that we will now proceed, and the second item on our agenda is introductions and opening comments by Stephanie Coffin.

MS. COFFIN: Stephanie Coffin, AP1000 Project Branch Chief.

I just want to kind of preview the agenda. Mr. Ray did a good job of that. It's going to cover a lot of material, and a wide variety of material on the COL side of the house. You are going to hear about AP1000 standard content in the area of systems, structures and components, bound to plant, training and accident analyses. The Safety Evaluations for these topics were issued last year.

On the DCD side of the house you are going to hear about Chapter 15 review topics, including the flow skirt and STRUM. Also gas intrusion in the reactor coolant pumps.

Tomorrow you are going to hear about how

this design center addressed regulations related to strategies for addressing loss of large areas of the plant due to explosions or fires, a beyond design basis event.

We also have a presentation on RTNSS, the Regulatory Treatment of Non-Safety Systems.

And lastly, although we can move this around if it suits the members, a discussion of action items from previous ACRS interactions, as well as a preview of coming attractions.

And unless there are any questions on that, I'd like to turn it over to Eddie Grant and Amy Aughtman at the front of the room.

MS. AUGHTMAN: Thank you, Stephanie.

Good morning, my name is Amy Aughtman, and I'm the AP1000 lead licensing engineer for Southern Nuclear.

Wes Sparkman is also here with me from Southern, and he is the COL project engineer.

Just to clarify and confirm what Mr. Ray was saying, Southern Nuclear is the applicant for the AP1000 RCOLA, and NuStart is here to support us, primarily those being Eddie Grant, Neil Haggerty, Bob Hirmanpour, and Richard Grumbir.

CHAIR RAY: Thank you. I was confused

before and uncertain when it said, applicant, and then listed just NuStart, but you have clarified that. Thank you.

Dr. Shack -- welcome Bill.

MS. AUGHTMAN: And bear with us a minute as we get the presentation pulled up.

CHAIR RAY: Certainly.

MS. AUGHTMAN: And I also wanted to note that we are joined today in the audience by some of our other fellow AP1000 applicants.

The benefit of working together as a DCWGN with NuStart is that we get the benefit of each other's expertise and experience. And we work together as a team.

CHAIR RAY: Well, as long as we are still -- well, it looks like we are there. But could you comment, Amy, on the process in which we are, at this time, as I understand it, addressing only standard content. Is that correct?

MS. AUGHTMAN: That is correct. The COLA chapter is being presented today and tomorrow. We will only be covering standard content. Based on where we are in the transition process for the R-COLA, there are no SERs yet on the Vogtle application. Those are still in process and they are developing an

SER with confirmatory items. So what we are working with are the open items that were standard, that were created for the Bellefonte SER.

CHAIR RAY: I'm sure you understand how difficult it is sometimes for us to get our mind around this process. Stephanie, would you have any comment you'd like to make about the fact that we are doing standard content now, and presumably we will do site-specific later when the SER is available?

MS. COFFIN: Sure. Let me first start off with the Final Safety Analysis Report that all of the applicants gave to us had something called left margin annotations where they clearly mark in their SAR what material is standard content. And likewise in our safety evaluation reports that document our review of that material, we very clearly delineate our findings on the standard content, and our findings on the plant-specific content.

So the conclusions that we have drawn, although they are issued against the Bellefonte docket, the conclusions we have drawn on standard content apply equally to every AP1000 COL applicant unless they draw it to our attention, and I can't think of any specific examples at this point in time, but where they are going to deviate from standard

content to make that clear and express that, and we will review that separately.

So the process of this transition is, we've issued the SER with open items on standard content, and Vogtle picking up the reins of being the reference COL for this application is going to respond to those open items for standard content, and the final resolution will be presented in the safety evaluation reports on Vogtle.

CHAIR RAY: Well, we are the -- I think Weidong called us the pioneers in this process in trying to figure out how to think about it, because naturally we are talking about standard content, but our minds will go into areas that is site-specific and no, you'll have to wait on that. That is what is difficult for us to think about sometimes.

Anyway, are you ready?

MS. AUGHTMAN: We're ready.

CHAIR RAY: Proceed.

MS. AUGHTMAN: Okay, so the first chapter we are going to start off with today is Chapter 3, and supporting this chapter again will be myself and Eddie Grant, and we do have Bret Collier from Enercon at the side table. And our Westinghouse support team is Ed Cummins and Rob Sisk.

Okay, this is the general contents of our Chapter 3. You may note some of the distinguishment in color on the slide there, at least on the screen. The first four sections are in black, and those contain primarily site-specific information or are primarily an IBR of the DCD. And the blue topics are the ones we wanted to focus on today that have the major standard content.

And the ones that are kind of grayed out, 3.7 and 3.8, those SERs have not been developed yet for those sections, pending resolution of open items on the DCD.

So again the DCD is incorporated by reference. There are no standard departures taken in this chapter. And I guess before I go through the rest of the slides, just to give you a little bit of an idea of how we organized the presentations, this is the format we're going to use for all of the COLA discussions. We let you know whether we have had any major departures from the DCD, how that is incorporated by reference into our chapter, and then talk through some of the major supplemental pieces of information.

And then the following slides will cover COL information items that were created from the DCD.

To distinguish between a COL item and what we're designating here as supplemental information, supplemental just means that wasn't a piece of information that was requested by the DCD item, but rather it was to cover a reg guide or an SRP requirement and/or addressing staff's request for additional information.

So again a large part of Chapter 3 is just incorporation by reference of the DCD. And some of the more major standard supplemental information includes the dual unit turbine missile consideration. And we actually gave this some pretty good air time I believe last October, in the Westinghouse Chapter 3 presentation. So you should be familiar with that.

Just in summary again, we found a probability of one times ten to the minus fifth for a turbine missile generation, which leads to one times ten to the minus seventh for probability of unacceptable damage, which does meet the SRP and reg guides for this area.

We also covered the snubber testing program, and the IST program for valves is really covered more in the COL item. But back on the snubber testing, what we covered here in the supplemental piece of information is the design and other testing

and installation requirements, while the COL item addressed separate, the IST and the pre-service requirements.

Moving on to the COL items --

CHAIR RAY: Excuse me, Amy, I was having the same thought as John was having as he talked with me. We did talk about turbine missiles as you said last October in the context of the DCD. This now is a four-unit site in essence, right?

MS. AUGHTMAN: Yes.

CHAIR RAY: And I think we need to explore this further here. Is this the time to do it or later?

MS. AUGHTMAN: Actually later.

CHAIR RAY: Okay.

MS. AUGHTMAN: There is a brief discussion of that, of the Units 1 and 2 impacts on 3 and 4 in the FSAR, but we consider that site-specific, and weren't planning to address that today.

CHAIR RAY: Okay, then we can discuss the dual unit aspects now?

MS. AUGHTMAN: Correct.

CHAIR RAY: Okay, John, did you want to --

MEMBER STETKAR: Yes, and unfortunately I

was not at the October meeting, so I'm not fully familiar with what was discussed at that time. I reviewed the WCAP on the turbine missile frequency analysis, and I had several questions both about the models that were used and the source of the data. And I think it's relatively important because you are justifying the ten to the minus five turbine missile ejection frequency as the basis for no concern regarding the unit-specific configuration at Vogtle.

But I don't know in the context of this meeting where to bring up the discussion about that turbine missile frequency analysis, because it's really part of a DCD analysis you are adopting by reference. I would like to have an opportunity to discuss it at some time, but I don't know what the appropriate venue or the time for that is, and I don't particularly want to interrupt or annoy you as a COL applicant with this discussion. But I wanted to kind of get it into the record.

CHAIR RAY: We do have an action item list. It is lengthy, and perhaps growing.

Ed, do you want to comment on that?

MR. CUMMINS: Yes, please, Ed Cummins, Westinghouse. I think we take it as an action item. We need the right people which we won't have, to bring

the right people to future meetings and answer your question.

CHAIR RAY: Okay. Thank you, Ed.

MS. AUGHTMAN: So we'll save your specific questions?

CHAIR RAY: Yes, it sounds like John's questions fit into the domain of the DCD. Mine have more to deal with the site itself, and so both of those I guess will wait until later -- different later.

MS. AUGHTMAN: So are we good to move on?

CHAIR RAY: I believe so.

MS. AUGHTMAN: The first major standard COL item that we are covering today is on 3.6-1, which is the pipe break hazards analysis. This item has two aspects to it. There is the as designed portion and the as-built phase.

Westinghouse is still actually having discussions with the staff on how to craft this information item, and we are working very closely with them and the staff to determine how best to address this item, and we are working those as open items on both the COL and DCD SERs. It will likely result in a standard post-license requirement for the design reports and the as-built.

The next item is the primary system inspection program for leak-before-break piping. Basically we just had a small section indicating we are confirming that the materials and programs that were discussed in the DCD are the ones we are planning to use. We will not be using any Alloy 690.

And then we are skipping ahead to 3.11 so that we can group all the 3.9s together on the next slide. So that is one reason for the holdup there. But in Section 3.11, that is environmental qualifications, and that's where we describe our file and the maintenance program for that. So we have a program description there for how we'll have procedures in place to administer that program.

MEMBER SHACK: Just coming back to the leak-before-break, and again, looking at the Bellefont application, there is a response that there is no Alloy 690 in the leak-before-break systems, and then it says there is some use of these materials in safe ends. Now is that a plant-specific issue that is different for Bellefonte than Vogtle, or is that a design issue?

MR. GRANT: Eddie Grant with NuStart. I'll have to take a quick look at the Bellefonte. I did not have that in front of me here. Do you have

that in front of you?

MEMBER SHACK: Yes.

MR. GRANT: Does it have a left margin annotation by any chance?

MEMBER SHACK: No, I'm looking at the SER.

MR. GRANT: Let me check on that and get back to you.

MEMBER SHACK: Is there a sort of design position that there is no nickel alloys in the primary system, there's no weld buttering, no safe ends from high nickel alloys?

MR. GRANT: There will be none that will be added by the applicants. The formal question on that, I guess, I would have to refer back to the DCD and ask them about the particulars.

CHAIR RAY: Bill, if you are looking at the SER aren't you by definition looking at then something that is only talking about standard content?

MEMBER SHACK: Well, it's a response to an RAI. They said there was none, and then there was an RAI, did you really mean none? And the answer seemed to be, no, we didn't really mean none; there's some.

MEMBER BROWN: The safe ends in the welds

were Alloy 690?

CHAIR RAY: Okay, well, it seems to me like if there is an SER on it it must be standard content. But Stephanie, do you want to --

MS. COFFIN: I have the Chapter 3 SER here, and the discussion that Dr. Shack is referring to is related to a standard COL item. And so my assumption is that that RAI response is not just for Bellefonte, but for this whole design center.

CHAIR RAY: Do you want to pursue it further?

MEMBER SHACK: No.

CHAIR RAY: Okay.

MEMBER ARMIJO: I just want to make sure that all of the piping other than safe ends, this issue that Bill brought up, is the 3.16 LN, is that correct?

MR. GRANT: Again, we would refer that back to the DCD. They are providing all that piping, and will address that in the DCD. I don't remember the particulars.

MEMBER ARMIJO: That's what it said in the SER, but I just wanted to make sure that was correct.

MR. GRANT: I would assume that to be

true.

MR. CUMMINS: This is Ed Cummins. I don't believe that's even true. We have main steam piping at LBB. It's not even stainless steel. So I think it is annotated in the section on the LBB, and curves are provided for each of the materials that are used, and in that section I believe you can find the materials for each one.

CHAIR RAY: Okay, Amy.

MS. AUGHTMAN: Any other questions on this slide?

MEMBER BROWN: Yes, I had one question on the equipment qualification slide. When I went through the SER and looked, there was an SER that asked for -- an RAI that asked for more information on mechanical systems, some additional information. And so that slide -- I just thought I'd go off and look for electrical stuff, since it didn't address that, and your COL says it's all incorporated by reference, went out and looked at the DCD. So this is more -- I'm not sure if this is a technical question or an informational or whether it's something else.

You identified zones, there is a table in the DCD that identifies the zone in which the equipment is installed, and identifies the normal

operating environment for it. And so I just picked the one where the I&C is, because that's what I'm interested in, and it says the normal environment for that is like 67 to 73 degrees F and that just raised the question with me which is, when you go qualify this equipment, which has not been qualified -- I know it's been qualified; I don't know what the status of it is, I presume that hasn't gone through that yet, when you finally design the hardware, what defines -- I wasn't able to find this fast enough -- what defined the broader range, or would you qualify this in case there is a casualty that takes you outside these normal operating environments? Is that covered somewhere?

MS. AUGHTMAN: I believe that would be a DCD.

MEMBER BROWN: I don't think -- have we done the DCD chapter on three yet?

MS. AUGHTMAN: For 3.11, yes.

MEMBER BROWN: Okay, well my question, I've still got a question. If I'm going backwards, I'm going backwards, but at some point I'd just like to have some idea -- or if there is standard by which this stuff gets qualified and where it defines that, that's fine. I just couldn't find it.

MR. GRANT: This is Eddie Grant with NuStart. There certainly is a standard for environmental qualification on IEEE 323s generally identifies what you are looking for there. They will take all the standard or normal environments; they will also consider post-accident environments and IEEE 323 explains how to apply those for the qualification practices. And then there is some margin attached to that as well.

MEMBER BROWN: Okay, I don't have any experience with commercial plants; mine has all been naval nuclear stuff. So the normal operating environment that we run is about 50 or 60 degrees F wide, and so is it reasonable to assume, I will ask some of the folks here.

MR. CUMMINS: So this is Ed Cummins, I think I can help you some. The AP1000 is designed to have no AC power for 72 hours. So the cooling for the main control room and the safety-related I&C cabinets there is in the ambient, the heat sink of concrete walls, and we try to put plates on them to trim for the heat better. In that time period the temperature, I don't remember the temperature, but I think it would be something like 90 degrees F that the temperature gets to, and we must therefore, whatever that

temperature is, qualify the instruments, or the I&C equipment for operation at that most upset temperatures when there is no cooling. So that is written I believe somewhere in 3.11 I believe.

MEMBER BROWN: In 3.11 in the DCD?

MR. CUMMINS: Right.

CHAIR RAY: Okay, so it's a function of analysis for the explicit control room in the plant based on the 72 hours and stuff of that nature, not necessarily a fixed temperature range that everything gets done to based on some standard.

MR. CUMMINS: If we didn't experience this 90 degrees we would be able to qualify it for a lower temperature.

CHAIR RAY: All right, thank you.

MS. AUGHTMAN: Ready for the next one?

CHAIR RAY: Yes.

MS. AUGHTMAN: Again, we're going back now to the COL information items that were addressed in Section 3.9. 3.9-2 is the non-specification and reports, and that is a post-license commitment for performing a reconciliation of the as-built piping after construction of the piping system and prior to fuel load.

So then the next item is snubber

operability testing. We are provided a standard list of the snubbers and testing criteria for the pre-service and in-service testing.

And then 3.9-4 we provided the standard program description for the valve in-service testing, and we do have some open items on that that Eddie Grant will address further in a minute.

And then 3.9-5 is the pressurizer surge line thermal monitoring standard program description that discusses the monitoring method, locations and data evaluation.

And if there are no questions on that slide --

CHAIR RAY: Well, he's going to talk about the --

MS. AUGHTMAN: Right, I'll turn it over to Eddie to cover the open items.

MR. GRANT: Yes, sir, thank you. Eddie Grant with NuStart.

We have similarly broken up the open items here in these two slides, the items other than 3.9 are on this slide, and then 3.9 is grouped together on the next slide.

The first open item is 3.6-1. It has to do with pipe rupture analysis. And this is related

back as we indicated to one of the COL items, so standard COL 3.6-1.

There has been a lot of discussion on this particular item both in the DCD and in the COL discussions, and there has been some modifications as well of the COL item or some are in the works. The COL item, if you go back and look at the DCD, describes an as-built reconciliation, and there has been some modification and discussion along the lines of including some additional design reports as part of an as-designed review or providing those reports at some time in the future, again, post-COL issuance. Both of these will be.

And so we are moving towards a revision to the COL item in the DCD that indicates that there will be both these as-designed reports and the as-built reconciliation. We have not finalized the wording in the COL in response to that revision because we need to see the exact words that are going to come out in the COL item. But once that comes out and is provided to the NRC and then we will revise our application on this particular open item to indicate again that we will provide a post-COL resolution of those as-built reports and of the as-built reconciliation on the piping.

CHAIR RAY: So this is a case where there is something that Westinghouse is going to do, and once they have done that then the COL applicants, NuStart, can do what they are going to do?

MR. GRANT: We can provide the information. In fact, Westinghouse is going to do all this work. They are going to do the --

CHAIR RAY: That is beside the point.

MR. GRANT: That is beside the point; you are exactly right.

As far as the licensing basis goes, and the reason that this was taken, is delayed in being resolved is, Westinghouse was attempting to achieve resolution on some of these reports and provide these reports now. They didn't quite get the number of reports done up front that the staff wanted to see in order to resolve the item.

So we are moving back to the COL applicant will provide those reports again at some future date. But yes. We will provide the information at some later date.

MEMBER ARMIJO: The issue is really just a timing issue.

MR. GRANT: It is.

MEMBER ARMIJO: Not a dispute over

whether these reports are needed or not needed?

MR. GRANT: Oh, absolutely not.

MEMBER ARMIJO: Okay.

MR. GRANT: We will provide the reports, the as-built reconciliations are absolutely required. It's just the timing on the as-designed reports and getting those available. We didn't quite make -- or Westinghouse didn't quite make that, so we're providing them under the COL application at some later date.

3.10, seismic qualification method and schedule, the open item here was the staff was interested in which method would be used. The DCD describes both testing and analysis as methods available to do seismic qualification. We will use both of those methods. The particular open item here was to be able to provide the specific method for which each type test will be done, and then also to provide a schedule for when that information will be available so that the staff could come and do an audit of the actual test package, the final qualification package.

We are far enough along that we can provide and are working on putting together -- we haven't quite gotten it in yet, but it should go in

any day -- to provide them with the method that will be used. Is it going to be a test qualification? Is it going to be an analysis qualification? Or some combination of the two? And we are putting that information together. We will be providing that to the staff, in the very near future, hopefully this week if there is anybody left back to assign it.

The other piece of that is the schedule. We are not quite far enough long in order to be able to tell them with any confidence when those packages will be ready to go. But similar to an ITAAC, which the regulation says must be -- we must provide a schedule for closure of ITAAC beginning a year after the COL is issued. So what we are proposing is to provide them a similar schedule beginning a year after the COL is issued of when those seismic qualification packages will be available, so that they can come and do their audits in a timely manner, well before fuel load.

The discussions with the staff seem to indicate that that will be appropriate and acceptable.

3.11, environmental qualification: this is really a placeholder for a DCD open item closure. The COL item as Amy described it was simply to describe what are we going to do with the packages and the

information that Westinghouse provides to us once they have completed the environmental qualification, and how are we going to maintain those packages.

This particular open item indicates that there is a DCD open item with regard to an audit that was done by the staff of the Westinghouse qualification procedures and practices. And they are working to close those particular audit items, and once those are closed, that open item will close, and that will then result in closure of the COL open item, again, a placeholder for the DCD.

With that I move to the 3.9, and of these there are six items under Chapter section 3.9 that are open items. All six of these are related to in-service testing, and the bottom is IST. The top one again is a DCD placeholder. There are several open items under the DCD for in-service testing. I think the staff is going to talk more about those in their slides. And this again is a placeholder to make sure that the DCD open items get closed, and that those don't impact the COL information and presuming that those are satisfactorily closed and don't require additional information under the COL then this item is closed. If it does require additional information then we will provide what is necessary in order to

close this particular item.

I'm going to skip down to items four and five, we have provided responses on those two particular open items on the potential periodic dynamic testing of power-operated valves, and on flow-inducted vibration concerns. Those responses have been reviewed by the staff. We've gotten verbal indications from them that the response is acceptable, so we believe the work is done on those two items.

The tech spec references there are some left over references from the old AP600 and the original application of the AP1000 that referred to ASME code rather than OM-1 -- not OM-1, but the OM code. So we are cleaning those up -- actually the DCD is cleaning those up, and we will adopt those directly. The staff has recently received from Westinghouse those changes to the tech specs that will clear those up, and we have indicated in our response that will adopt those same changes of course, and put those into our tech specs. So again we believe that we have an acceptable resolution on those.

3.92 3.93, I'll move back to those, there were some questions from the staff with regard to clarifications on MOV discussions and how those might apply to the rest of the power-operated valves, and

also on MOV testing during operation. There are similar questions for the DCD, and open items related to the DCD information, and so those two items we are still working on the responses because we needed to see how the open items would be responded to under the DCD open items again, and they would impact potentially the information that we would provide. Westinghouse has provided those responses just last week, and we are working towards our revisions and our responses to those two open items. So this week and over the next couple of weeks, in order to be able to provide those. We have had discussions with the staff on those; we believe we understand what they're looking for, and we'll be able to provide the information.

Questions, yes, sir?

MEMBER STETKAR: Eddie, I think this is a CLA item if my notes are correct here.

There are several references in the COLA FSAR under both the motor-operated valve and other power operated valve testing programs. They include statements like valves are categorized according to their safety significance and risk ranking, periodic static testing is performed at a minimum on high risk valves, things like that.

How are the risk importance and risk ranking of these valves determined? And is the proposed in-service testing program a risk-informed testing program?

MR. GRANT: Certainly to the extent that it is identified there it is risk informed. But I'm going to ask Bret Collier with Intercon to help me out with how that list ranking is performed. I think I know the answer, but he will know it better.

MR. COLLIER: I'm Bret Collier, Intercon, supporting NuStart. The risk ranking -- well, I guess first, IST is not going to be the risk informed category. It's going to follow the ASME code. The risk portion of it is what's primarily covered under the MOE program, through JOG, 9605, and the MPR-2524a program.

The rest of the specifics on that is some of what we are still working through as Eddie Grant has said with the responses that Westinghouse has provided last week.

MR. GRANT: But the basic --

MEMBER STETKAR: I guess I didn't hear the answer to my question, and that was, how is the risk ranking actually determined? What tool is used to determine the relative risk ranking of a particular

valve?

MR. COLLIER: The site PRA program, and that defines the risk, that defines the risk of a valve.

MEMBER STETKAR: Okay, so the PRA then, I don't think we've seen the PRA for a section of the COLA yet. So I don't know whether you are just adopting the Chapter 19. I assume we will.

MR. GRANT: We will.

MEMBER STETKAR: That's an assumption.

MR. GRANT: It's a good one.

MEMBER STETKAR: So that means that the PRA that is documented in Chapter 19 of the DCD will form the basis for that risk ranking of valves; is that correct?

MR. GRANT: Well, it's certainly an input to it. As Bret indicated, and it's the primary input with regard to safety for a particular valve, and the risk associated with failure of a particular valve. Some of the other inputs, though, come from the joint owners group program that he talked about on failure mechanisms and failure rates and those types of things that we were provided through those industry programs, industry-developed programs that he referred to.

MEMBER STETKAR: Okay, I'm not

particularly familiar with those industry programs, but I was curious in terms of the design specific risk ranking of a particular valve, how that is actually determined. Given a particular valve inside the plant, how do I understand where that particular valve relates to another valve in terms of its risk ranking?

MR. GRANT: That would definitely be out of the Chapter 19 related PRA.

MEMBER BONACA: The PRA by itself is not sufficient to provide the ranking. You've got to have some criteria that you have to establish on redundant systems that you have to use, so the PRA itself is not sufficient.

MR. GRANT: Ed, can you help us out?

MR. CUMMINS: Maybe. The only way we have classified equipment relative to its importance to the PRA is using the DRAP, the Design Reliability Availability Program. And there are criteria related to how much benefit or how much harm a -- any piece of equipment has if you take it out or if you fail it, and then you screen them for some screens that screen in a list of things that put things into the DRAP program. And valves are in that, though I didn't recognize that that was going to be or course be used for this valve priority program; I'm not sure that

it's the same thing. The concept could be used to measure the impact of a component by failing it, and seeing what effect that had on the PRA, and putting it back in and seeing what benefit it has for the PRA which is how DRAP is done.

MR. GRANT: Right, we agree, PRA would not be sufficient in and of itself. But there would be an input -- and again, we would look at some of the other things, failure rates for that particular type of valve, failure mechanisms, those types of things, in order to do the risk ranking.

MEMBER BONACA: Yes, I think it would be important at some point that we review that.

MR. GRANT: The in-service test program itself will not be developed until sometime well after COL is issued. It will be one of those things, program development that is provided and available for NRC audit and review prior to fueling, but it's several years out, the details of how that's going to work.

MEMBER STETKAR: This may be a question for the staff. I'm assuming the program will have a list, include a list of valves that are subject to various I don't know whether it'd be testing frequencies or programs or something like that. Is

that list developed coincidentally with the program itself? Or is that list produced prior to the program? You're saying the program won't be available until later.

MR. GRANT: Right. The list of valves in the DCD that are in the AP1000 designs, actually in the DCD as Table 3.9-16. There's quite a list and it has a number of columns to indicate many things including testing.

MR. CUMMINS: This is Ed Cummins. That list has no input from the PRA. That has an input from the rules, the ASME rules. And we decide whether it's active to shut or active to open. And as you go through what you use the valve for, you follow the rules.

MR. GRANT: Right, and the risk ranking again comes later with the program development. But the list of valves that will be in the program is already in there.

MEMBER STETKAR: Yes, certainly if a valve is not in that table it will not be in the program.

MR. GRANT: Well, I wouldn't say that either. I mean there is a possibility we might look at some other things and add things to it.

MEMBER STETKAR: But I mean the table in the DCD is designed to be a master list?

MR. GRANT: Absolutely.

MEMBER STETKAR: Thank you.

MR. GRANT: Other questions?

CHAIR RAY: I think that wraps us up for Chapter 3 from the applicant.

Tom you and Graham of course speak up if you have anything.

We'll turn it over to Seth then for their portion.

MR. GRANT: Good.

(Comments off the record)

CHAIR RAY: Stephanie.

MS. COFFIN: Terri Spicher is the project manager for Chapter 3, and she is going to introduce the chapter, and then we have a number of technical reviewers on her right that she will introduce for the technical discussion.

I did want to make just sort of one comment. Eddie Grant talked about how the programs don't get developed until some time after they receive a license should we make that decision to issue one. But they are obligated to describe the program for us to make our licensing decision. So we know what the

elements of those programs are going to consist of, and then the applicants are obligated to develop those programs consistently, how they describe then in their SAR.

MEMBER STETKAR: The elements of the program, though, don't necessarily go to the detail though of a list of specific valves and the criteria for those valves?

MS. COFFIN: No.

MEMBER STETKAR: Okay.

MS. SPICHER: Good morning, my name is Terri Spicher, and I'm the PM for Chapter 3.

This morning you are going to be briefed on the open items that were discussed in the safety evaluation report you received last year, the standard content open items.

Then since you received I think the evaluation report, some of the items have been closed; some are DCD open items. The staff will update you on where that stands, so you will hear a mixture of both from our staff today.

You will hear presentations from four staff members. The four staff members have the open items as you read in your safety evaluation reports. Just to give you a brief review.

The first open items are in Section 3.3 in the wind and tornado loadings. Jerry is going to give you an update on those open items.

The second area of concern, or open items, I should say, was in 3.5, missile protection. John is going to give you an update on those open items.

The third area is 3.6, with piping and the postulated rupture of piping, and they will give you an update on that.

And the last area will be by Tom Scarbrough. He will join us, and he will go over 3.9 open items.

Tom will also go over the 3.11 open items.

This slide just goes through the exact verbiage that was in the safety evaluation report. These were the standard supplemental items that were standard content which are just worded exactly like was in the safety evaluation report. They are a repeat of what I just said. There's one for 3.3, there is one for 3.5, there is one for 3.6, 3.9 has one IST program, STD COL item, but it has multiple areas that we will discuss today; and 3.11 we will discuss that open item.

The format of our presentation will be, we'll start off with the blue standard COL items.

We'll go through them, and again, you will either hear it's still open, it could be closed, it could be part of the DCD open item, but we will go through and explain it to you.

Jerry is our first presenter.

MR. CHUANG: Good morning, my name is Jerry Chuang from STD 1, and I'm going to address the open items on SRP Section 3.3-2. This open item is related to the effects of the tornado-initiated barrier of non-safety-related buildings on 11 seismic category one structures. Now there are two open items identified from this event. Number one is the seismic missiles, generally from the collapse of the non-safety-related buildings. And the second open item is related to the water tanks that is in the radwaste buildings. This is also collapse of non-safety-related buildings.

This is related to open item number one, the seismic missiles. Now remember, there are two classifications of missiles. One is external, another is internal. For external missiles it's very difficult to erect the barrier to protect the SSC important to safety from missile attack as expressed by SRP 3.5.3, barrier design. This means that once this missile ignition is primary there is no barrier to protect.

So it's likely this missile would likely impact on the Category 1 structures.

The damage is likely to be local, and the potential is that it is going to be in the form of cracks, and as we know the presence of a crack is very worrisome. It is made rather unstable under stress, depending on the crack size and the stress field. So I think we need to make sure that the presence of these cracks will not compromise the structural integrity of the nuclear island regions.

Open item number two addresses another missile type. This is water tank similar to the automobiles -- missiles from the parking lot. Here is a sketch of the radwaste building. On the left side is an engineer's drawing or a plan and on the right hand side is the conception of the front view. As you can see there are three additional water tanks each with 105,000 pounds of water in there. So once the building collapsed due to the impact, and those tanks were set free and move just like an automobile. Remember the mass of this water tank is ten times heavier than a typical 3,000 pound automobile. So it considers the global impact on the Category 1 building, and we need to make sure that this impact will not compromise the buildings.

CONSULTANT WALLIS: Could you clarify, the whole -- the entire water tank becomes airborne?

MR. CHUANG: Just like an automobile in the parking lot.

CONSULTANT WALLIS: And they are attached to each other, are they, or something?

MR. CHUANG: We assume, when the building collapses, the components, either internal or external components, of this building, including the content were set free. So they are free to move, unless there is a strong angle down.

CONSULTANT WALLIS: They are held down, aren't they?

MR. CHUANG: Yes, but there is no requirement. If they can provide the analysis to show the angle of support underneath can strongly support it from moving out, then it's okay.

MEMBER BROWN: Don't they have any seismic requirements?

MR. CHUANG: No seismic.

MEMBER BROWN: There's nothing to hold them in place under some type of an earthquake. There is no large structural foundation?

MR. CHUANG: Non-seismic category. There is category one, and category two is non-seismic. This

is the non-seismic category.

MEMBER BROWN: For the whole water tank?

MR. CHUANG: Only in the worst-case scenario.

MEMBER ARMIJO: Is there any example of things of that mass and that geometry being flung around in a real tornado?

MR. CHUANG: As I said, a good analogue is an automobile in a parking lot.

MEMBER ARMIJO: This is a 100,000 pound tank, right?

MEMBER BROWN: Just a minute, I think he said 30 -- total was 100. I thought it was 30,000 pounds per --

MR. CHUANG: One tank is 100,000.

MEMBER BROWN: Oh, one tank? Oh, okay, 10 times -- you used the number 10 times, so that's really 30 times.

MR. CHUANG: Yes, that's about right.

MEMBER ARMIJO: So there are no examples for things of that size and that massive being flung around by a tornado? So to make your connection with reality here?

MR. CHUANG: This is the first time I've seen this kind of design. But in the real case, I

mean, this one, from the parking, the automobile is really flying.

MEMBER ARMIJO: I believe that. I'm just wondering about this particular --

MR. CHUANG: I believe it was verified.

CONSULTANT WALLIS: Do you make any rough calculations of the --

MR. CHUANG: I think Westinghouse did some rough calculation and kinetic energies.

CONSULTANT WALLIS: I think the force on it from the wind versus its weight, you should be able to calculate something about will it fly or not.

MR. CHUANG: We did. We did. And the preliminary result is 100 tons too high. I think we are still doing similar calculations only automobile, because it is raised parking lot.

CONSULTANT WALLIS: So it should be possible to resolve by a simple calculation?

MR. CHUANG: Yes. If it's too high, then another solution is to design a strong support to prevent it from moving.

MEMBER ARMIJO: That seems incredible.

MEMBER ARMIJO: Thank you, Jerry.

We will now move to Section 3.5.

MR. HONCHARIK: Hi, my name is John

Honcharik, and I work in the division of engineering, component integrity branch.

I'm going to talk today about the standard supplement, 3.5-1, which is the turbine missiles. I know you discussed this a little bit earlier. I'm going to talk more about just the orientation of the co-located plants here.

MEMBER STETKAR: John, I'm going to interrupt you before you get to the site-specific information. Reading the turbine missile analysis, their analysis if I recall it correctly came out with a frequency that was slightly higher than ten to the minus five, but if you made assumptions about operations of the equipment after the database period that they used, they could somehow justify that it would be slightly less than ten to the minus five. Is that correct? Do you remember enough about it, or are we treading on thin ice here?

MR. HONCHARIK: Well, I wasn't the primary reviewer for that.

MEMBER STETKAR: I'll save that.

MR. HONCHARIK: That's in Chapter 10. But I believe that it was less than 10 to the minus five even before that. I think they just added a lot more conservative -- because actually I think, they

use that analysis to determine their inspection frequency. And I think even before that it was less than what they're claiming now for 10 years, and I think just adding that fact they're extending it out even more, further, like 24 years. So they are even being more conservative. So I can't really -- I'm not sure about that.

MEMBER STETKAR: That's fine. We'll get into that detail whenever the topic comes up on the analysis. Thanks, I was just trying to prod my memory.

MR. HONCHARIK: I knew there was an open item with that, because I think it did mention about the -- how they correlated some of that data, and I think there were some typos here and there, so I think that might have been the issue there. I don't know if that had an effect.

CONSULTANT WALLIS: I have a technical question about this unfavorably oriented qualification here. You are right about things like low pressure blades coming off, big long blades. They are shaped like an air foil. They are very curved. Now I'm not convinced that they go in a straight line when they come off. They fly through the air, and there's all kinds of forces on these things because of their

shape. And I'm not convinced that they wouldn't go in some sort of an arc. So I'm not sure how you figure out what's favorably and unfavorably oriented.

MR. HONCHARIK: I guess per the reg guides that we have, Reg Guide 1.15, and it basically gives a description of what's favorable, because what we're concerned about is the turbine motor because of its mass.

CONSULTANT WALLIS: The whole rotor isn't going to fly through the air, is it?

CHAIR RAY: No, it's not the blades either. It's the disk. The disk is a big chunk of metal, believe me.

MR. HONCHARIK: The blades can fly out, but they are not that heavy compared to the rotor.

CONSULTANT WALLIS: But the blades have a lot more velocity than the rotor does.

MR. HONCHARIK: Correct, but the rotor which is just massive --

CHAIR RAY: There's pieces of the rotor coming off.

MR. HONCHARIK: Right, it's something cracking.

CONSULTANT WALLIS: Do they go in straight lines, or where do they go when they fly

through the air?

MR. HONCHARIK: Well, based on the Reg Guide, and experience, they usually come out perpendicular with an arc of plus or minus 25 degrees. So basically if your safety related components are not within that area, then they consider that to be --

CONSULTANT WALLIS: So there is some experimental evidence about how much they come out away, straight out, 25 degrees?

MR. HONCHARIK: Plus or minus 25 degrees.

So basically if you keep your safety equipment outside of that they call it the missile strike zone --

CONSULTANT WALLIS: There are no other blades? I'm surprised there's no other blades.

MEMBER BLEY: From the calculations, and it's been a long time since I've seen them, if the blades, they can't get outside of the housing.

CONSULTANT WALLIS: They're caught by the housing? Okay, thank you.

MEMBER BLEY: It's when the rotor comes apart that they can break the housing.

CHAIR RAY: The rotor disc is what I call them. Anyway they're shrunk on the shaft and they can crack and come apart.

CONSULTANT WALLIS: Okay, thank you.

MR. HONCHARIK: I was going to discuss the standard supplement, it's 3.5-1. This standard supplement basically states that two AP1000 units collocated side by side have turbine generators with unfavorable orientation with respect to safety related equipment, it's in that low trajectory missile strike zone which we just discussed.

The bounding turbine missile probability analysis in Section 10.2-8 of the AP1000 DCD meets the Reg Guide criteria that the probability of a turbine missile is less than one times ten to the minus five, for unfavorably oriented turbine. So that basically is what the supplement states.

In looking at the AP1000 DCD, Section 3.5.1.3, kind of implies that the low trajectory missiles cannot strike safety related equipment, and therefore the turbine generator is favorably oriented, and that high trajectory missiles were evaluated to be less than ten to the minus five. So therefore we have an open item that existed for the AP1000 DCD, which is open item 10.2.3, that's CIB 1-01, and the bounding turbine missile probability analysis is only applicable to the high trajectory missiles.

So therefore analysis for the low

trajectory missiles is required for this unfavorably oriented turbine generators.

Four, that the DCD should have a COL action item to provide this analysis.

But through some RAIs, staff finds that this stands up an open item to be resolved, since Westinghouse clarified that although the DCD is a single unit which is favorably oriented with respect to the turbine generator and safety related equipment, the turbine missile probability analysis applicable to both the high and low trajectory missiles. The analysis determines the probability of generating this missile, due to a turbine rotor burst, regardless of the angle of trajectory. So they just basically did not account for the angles. They just said it's going to burst, and what is the probability of that.

Therefore the staff finds this open item resolved.

CHAIR RAY: Yes, that was a really long, wordy thing that was maybe a little hard to follow. The point I guess is that the resolution was a conservative assumption that didn't take credit for the angle -- because of the desire to include co-located units didn't take credit for the low probability angle outside the 25 degree wedge that you

are talking about.

MR. HONCHARIK: Right.

CHAIR RAY: And therefore it has to meet the criteria that would apply within that zone. I keep getting them confused between low angle and high angle, but at any rate it's a conservative resolution --

MR. HONCHARIK: Yes.

CHAIR RAY: -- is what you're describing. Okay.

MS. SPICHER: Thank you.

Our next COL item we'd like to discuss with you is 3.6, the pipe rupture hazard analysis. And Renee will give that presentation.

MS. LI: I'm Renee Li from the division of engineering. Originally my presentation today is pertaining to the COL items 3.6-1, which is related to pipe break hazard analysis.

However in a meeting with staff last week Westinghouse informed staff that they are going to change their approach related to both piping back and pipe break hazard analysis.

Therefore I am going to address both piping back and pipe break analysis in today's presentation.

As some background information, in late 2006, Westinghouse set removal of the piping break and closure of COL item involving audit of the pipe break hazard analysis as two of the changes to be made in their DCD amendment. As I mentioned last week on January 27, 2010, Westinghouse informed NRC that they will not be completing either the piping design or the pipe break hazard analysis.

Westinghouse proposed to include COL items for audit of the piping design and pipe break hazard analysis. In addition a roadmap will be provided in DCD to guide closure in the future.

The staff after the meeting we determined that Westinghouse proposal is acceptable, because it will provide the staff with an opportunity to audit the piping design and the COL applicants with guidance to better define how to address closure in the future for those piping designs and pipe break hazard analysis.

The staff will work with Westinghouse on appropriate ways to close existing opens, and we will also work with COL applicant to address the COL items.

Therefore in summary those piping break and pipe break hazard analysis remain as open items to be addressed by COL applicants.

MEMBER BROWN: This will be during construction? When does this happen? It's after the license is granted?

MS. LI: Right, those are the details we need to work out with both Westinghouse and COL applicant, because naturally we prefer that the design to be completed prior to construction and installation. However, based on our experience of doing other design and discussion with the COL applicant, some did propose that they were provide a closer schedule to allow the staff to audit their design, but no complete timeframe wording that, yes, it will be prior to construction and installation, I think Part 52 did alert, that would be the risk they are taking, because once the construction starts --

CHAIR RAY: Wait, wait, excuse me, we are wandering off the track here a little bit. We're not going to issue the license with an open item, right? It's going to have some ITAC or something.

MEMBER BROWN: That was my next question.

CHAIR RAY: Yes, I could see that coming. Not to worry.

MS. COFFIN: We can fill you in on the process. If you recall Rev. 15 of the DCD was approved with something called a piping DAC design

acceptance criteria, and for a number of reasons the original goal was to resolve this DAC as part of this amendment. It looks like that is not going to happen. So essentially in essence the piping DAC which describes the process, the methodology, the acceptance criteria for doing the design, will remain in the DCD and that's incorporated by reference for the applicant.

So we issue the license based on the piping DAC, and the DAC is resolved similar to an ITAAC, and then staff will go and inspect that they did their piping designs in accordance with the methodologies in these criteria that we've reviewed and approved as part of the DCD.

MEMBER SHACK: That was my question. The DAC are going back to the Rev. 15 DAC for the piping.

MS. COFFIN: They might be modified somewhat?

MS. McKENNA: This is Eileen McKenna, AP1000 DC side. There will be something in the DCD. It may not be exactly the same DAC we had before, but there will be something there, that gets incorporated into the COL and would be resolved somewhere down the road, either -- for going on the COL, it could be before the COL is issued, a plant that is further down

the pipeline. Or it could be done after the COL sometime before construction obviously begins. You can't build it until you've designed it. And then it would be handled as an ITAAC.

CHAIR RAY: The short answer is yes. It won't be exactly the same, but it'll be functionally the same.

MEMBER BROWN: You used two different words, DAC and ITAAC.

CHAIR RAY: Well, DAC are part of ITAAC.

MEMBER BROWN: I understand that. I'm old, but I haven't lost --

CHAIR RAY: All right, I'm just trying to speed things along here, Charley.

MEMBER BROWN: My interest here is that there is -- an ITAAC I view as more guys down on the ground inspecting to see that somebody put in a pipe and did the welding and all that stuff. The DAC is the design side, and the staff gets the opportunity to see the design part of this, or does this just all disappear from NRC's viewpoint once the DAC in this case is in the COL, or wherever, the DCD?

CHAIR RAY: I think that is a generic question you're posing here now.

MEMBER BROWN: We haven't had that

answered yet.

CHAIR RAY: That's true, but this probably isn't the best place to try and answer it.

MEMBER BROWN: All right, I'll quit.

CONSULTANT WALLIS: Can I ask a question?

CHAIR RAY: Yes.

CONSULTANT WALLIS: Maybe I'm just even after 10 years with this committee I'm still naïve about things, but I thought pipe rupture hazard analysis was important, and I would think it would be part of certification of the design. I don't understand a situation where Westinghouse is going to provide advice on how to get to closure, and everything is left to some sort of a DAC. When things may have been built. Surely you want to be sure this is a good design, and the pipe rupture hazard has been taken care of. I don't understand what's going on.

CHAIR RAY: Okay, I think you are asking a question about whether it's appropriate for pipe rupture hazard analysis to be covered by DAC.

CONSULTANT WALLIS: It seems rather strange.

CHAIR RAY: I know this is a generic discussion we keep having. And I'm not wanting to suggest that it's been resolved in any way. But it's

not unique to this topic here.

Now Eileen, go ahead.

MS. McKENNA: I just want to clarify, and Renee can certainly help me. It's not that the staff has no knowledge of what the pipe rupture analysis looks like. It's the matter of the completion of for example the piping analysis to determine whether there are any intermediate locations that need to be evaluated to see whether you need a whip restraint or something like that, and the specific details of the design of some of those whip restraints or jet impingement shields are not done. But it's not that the pipe break hazard analysis is a homework problem to be done in the future. I just wanted to disabuse you of that impression that may have been left, that we have no --

CHAIR RAY: Well, Eileen, we may still have that impression.

(Laughter)

I think this is a generic issue. It deserves our considered attention, and the point that Graham is making is valid. But your point about this isn't left as a homework assignment just sort of illustrates what's of concern to many of us. And I guess at this point in time I still think we are

looking at an example of the generic issue that we've recognized and I'm not sure we want to try and resolve it here, and now. This -- the certification was issued with this covered as DAC. We are amending the certification. It was hoped that this would be resolved. I'm sure Westinghouse hoped that it would be resolved. Surely the COL applicants would like to see it resolved. It isn't resolved. So it's still DAC just like in the existing certification. And like I say I'm not meaning to terminate forever an important issue, but I do think we ought to move on, because all that is being said here is, it's going to remain DAC just like it is now. And I just don't want to get into a prolonged debate over whether or not the agency was correct in certifying something with DAC on pipe rupture in the first place. That's the way it is; it's not being changed; and I think we ought to take it up as a generic issue later.

MS. LI: Yes, that's right, and let me supplement. For the back approach, when we certified the design in Amendment 15, the staff has reviewed the methodology and criteria for both piping design and the pipe rupture hazard analysis. One thing you have left open is how Westinghouse will implement those criteria.

CHAIR RAY: Understand.

MS. LI: Whether they implement correctly, that is what the staff needs to verify.

CHAIR RAY: But understand our concern is, did we go far enough in doing what you said has already been done, and again, that's a lengthy discussion that I don't think we can try and resolve here.

MS. LI: Just one bit of information is, unfortunately the completion of pipe rupture hazard analysis depends on the completion of piping design.

CHAIR RAY: I know. You have to invest a lot of money to resolve this basically, and that's not happened yet, although it's happening I'm sure, and it will be done at some point in time. But on the schedule we are on, the DAC in this case isn't being removed; it's going to be left in place in some form. And that I think is the simplest way to think about it. Okay.

MEMBER ARMIJO: It's justified by precedent.

CHAIR RAY: I don't often buy that, Sam. In any event, I don't want to go back and question what was done in the certification here this morning.

MEMBER SHACK: But to go a little

further, it seems that it will still be back in the standard content. So it's pushed off one more step in the resolution.

CHAIR RAY: In the standard content. But I guess I'm not surprised by that. Given the first step, that step seems like a natural obvious one to me. It's the site specific way that you can say, wait a minute, that's a bridge too far.

(Comments off the record)

CHAIR RAY: What I'm saying is, in the site specific you might say, well, that's going further than we should. We should resolve this before issuing the COL, the combined licensing. But anyway, we've had an interesting discussion that reminds us all of where we stand, but let's proceed.

MS. SPICHER: Thank you, Renee.

Our last area of 3.9 will be related to IST program as well as 3.11, and Tom will address that.

MR. SCARBROUGH: Good morning. I'm Tom Scarbrough with the component integrity branch.

Just a little background for in-service testing, as you know it's an operational program. And operational programs are dealt differently than the sort of design oriented aspects. In the design

certification and the design control document we look at the design aspects as it relates to in-service testing; accessibility, how are you able to do those tests; and that sort of thing. And look at the general description of the program. But we don't make a final conclusion regarding the operational program such as IST.

Then when we get to the COL application, per the commission papers SECY-05-0197, we look at how the COL applicant has fully described the program. And they don't have the program itself, but they have to fully describe it, and there is criteria in that SECY paper that indicates that it has to be sufficiently detailed that we can reach a finding to grant an operating license for this plant.

So that is where we go in with these two different types of review that we do for design certification and for COL application. Now for this particular case, for AP1000, we have a public meeting with Westinghouse and the R-COLAs in the spring of '08, and we went over the issues that we needed to deal with. Reg Guide 1.206 provides guidance on the information that we need to make a finding on the IST program. And Westinghouse and the R-COLA decided which group would deal with which issue. In some

cases Westinghouse decided to modify the DCD, to put in additional information there. Other places they relied on the R-COLA. The R-COLA decided they would put additional information in the FSAR to cover that area.

So combined the net result is intended to be a fully described IST program. We followed up with an audit in the fall of '08, at Westinghouse, where we looked at the implementation, we looked at the design and procurement specs for components, because one of the aspects we found from our lessons learned from IST over the years is that if you don't have an adequate functional design qualification program your IST is not going to work, and so we found that out with motor-operated valves.

So we want to look and see what their basis is for the initial design qualification. So we did some of that at the audit, and that's what we'll talk about.

So we ended up with some open items for both the DCP, AP1000, and for the R-COLA, and of course that has been transferred, and transferred over to Southern Nuclear.

So that's a little background. As we go through it we have several AP1000 open items, and

several R-COLA open items, but all of them are on a success path, and I'll walk through them right now for you.

So starting with the AP1000 SER Section 3.9.6, our open item #1 was the followup items from the October 2008 audit that we did at Westinghouse. And there were four basic areas that we had. One was the reference to ASME standard QME-1-2007, which is the new updated standard by ASME which we accepted in Reg Guide 1.100 pretty cleanly for functional design qualification. And that is the reference in the design and procurement specs at Westinghouse for their components.

One place we thought it would be important would be to reference that directly in the design control documents. We did receive a letter from Westinghouse -- yes, sir.

MEMBER SHACK: Tom, we had some discussion before about whether this -- you know, they were picking high risk components, but apparently they weren't following Reg Guide 1.175. They don't have a risk-informed in-service testing program. Does QME-1-2007 give you some guidance outside of 1.165 for how to pick high risk components?

MR. SCARBROUGH: No, QME-1-2007 is a

pure design oriented standard qualification for the component. There is no ranking for risk in QME-1.

MEMBER SHACK: If you are not following 1.175, is there some other guidance for selecting high risk components?

MR. SCARBROUGH: Right, the risk aspect falls into the in-service testing phase. The initial design qualifications is going to be just pure design qualifications, standard Appendix A Part 50. There is no risk ranking for design.

MEMBER STETKAR: That applies only for safety related?

MR. SCARBROUGH: Yes, for safety related. This is the safety related program, right.

So QME-1 they are going to reference -- they are going to use that document, and I'll jump ahead a little bit because I know the question came up on the risk ranking for the JOG program. The Joint Owners Group program provides a graduated surveillance interval for motor-operated valves, based on their amount or margin and their risk significance.

When we reviewed the job program, we did indicate that the applicant or licensees will need to use an accepted approach for risk ranking. There is ASME code case OMN-3, which we accept in Reg Guide

1.192, which is a PRA risk ranking type of a process, and that would be an acceptable approach. A lot of plants now have risk ranking processes that go through the review process.

When we get to that phase, once they actually start developing and implementing the program, and we'll be doing operational program inspections, we will be looking at their ranking of their valves, and where they stand, and if we have questions about either their approach or risk ranking or any particular valve we will ask questions about that and find out what the basis for that was.

MEMBER STETKAR: Part of my concern, and this gets back to the whole issue of RNSS, is that all of the standards requirements pertain to safety related equipment. There may be relatively risk significant valves that are not safety related but indeed should be subject to rather detailed testing let's say. And I'm curious how the process makes sure that those valves are identified and included in the program. Because if you establish list of safety related valves based on design criteria and then look at that list in terms of the relative risk ranking of components within that list, you've not expanded your horizon out to all of those other valves. And that is

the question of how does that process come back and ensure that indeed the entire population of valves has been examined.

MR. SCARBROUGH: Now, this program itself, the IST program, focused on the ASME code, scope valves. They're basically safety related, and then within that you rank them on how frequently you need to do a full diagnostic test on them. They still have an at least every fueling outage be stroked, to be able to make sure they are operating within that boundary, and then you can lengthen the time period over which you do perform detailed diagnostics from every one outage for high risk low margin valves, to every 10 years for this diagnostic to the high margin and low risk valves.

So that is within the scope of this program. It's not the classic risk-informed program where you take the entire scope of all the valves in the entire plant and start ranking them to see which ones you want to pull up into an additional program. I would expect that to be done through the PRA, the regulatory treatment of non-safety systems process, where they have RTNSS, or R-T-N-S-S programs, that sort of thing, to look at what might be high ranked risk valves and decide they want to do additional work

on those.

MEMBER STETKAR: Let me make sure that I'm hearing or understanding you correctly. From what I just heard it sounds like the IST program that will be developed and reviewed by the staff prior to fuel load I guess or whenever that is, from what I heard you saying, it sounds like it will only include safety-related valves. Is that correct?

MR. SCARBROUGH: The inspection program for the operational program, the scope is limited to the ASME code scope. That is the inspection program. Now there is the program itself, and you will find this in the list of valves that are in the components list, many times a licensee will include particular components like puncture valves that they consider to be important from an operational point of view for the plant, to move them up into the IST program and call them augmented, or augmented IST. So they sort of are pulled into that, so we get a chance to take a look at those as well.

Now when we -- when the PRA, the whole PRA group is a different group in terms of doing the reviews. And I would imagine that that would be something that they look at in terms of risk ranking, are they properly risk ranking their components. But

from just the group that I work in, we focus on the ASME code stuff.

MEMBER BONACA: I think -- is this program going to be the same for all the applicants that come under a certified design?

MR. SCARBROUGH: Yes, what is going to happen is, the DCD includes the generic aspects of the program, the R-COLA incorporates by reference those generic aspects into its FSAR, then it supplements that information, with those provisions, with information that is considered the standard content of such as the description in there of snubber IST and also the power operated valves, other than motor-operated valves that is spelled out in the R-COLA FSAR, and that is our standard contact. So that combined will be followed for every supplement, every S-COLA that comes down the pike.

MEMBER BONACA: So you are going to have a classification process that translates the PRA into certain commitments to the components?

MR. SCARBROUGH: Right. Each plant will use their own PRA to develop their risk ranking. Now -- because each plant -- that would be each plant's responsibility. So from the risk-ranking perspective, that would be for each plant. But the program itself

in terms of following the Joint Owners Group program, in terms of risk ranking and setting up a schedule, once they are in a rank, either high or low or medium, and they have a margin assigned to them, they would follow the approach of the Joint Owners Group program. But each PRA for each plant would be different. I imagine it's pretty similar for all the plants that are AP1000s but each plant would have to show what its own risk ranking was for the component.

All right, so I'll jump back to, this is the audit findings here. But there were a couple of other audit findings. One was in terms of gate and globe valve seat friction coefficients. As you know those numbers were just assumed in the past, in some cases without a lot of basis. And so we are -- the January 26th letter from Westinghouse indicates they are going to clarify that in their procurement specs, that those seat friction coefficients are just a starting point, and they have to follow the QME-1 standard to develop the qualification.

CONSULTANT WALLIS: Do those get inspected? Are the measurements of friction coefficient through the life of the valve, or is it just an initial condition?

MR. SCARBROUGH: Well, that was part of

what the Joint Owners Group program did. The Joint Owners Group program tested over five years I don't know 100 valves. There were a couple of valves per plant that they tested over a series of three tests over a five-year period to look to find out which valves might increase in the friction coefficient over time. And what they found is, if you are able to generate a friction coefficient on the stellite that reaches a plateau over time for the most part -- and there were a couple of exceptions there -- but for the most part if you can determine what that plateau friction coefficient is, it stays there; it doesn't go up after that.

And so what they will have to do in the Joint Owners Group program is they have to when they follow it, they have to set up these valves at the plateau value. They can't go -- like for example if you opened the valve up and then right after that you ran a test, the air on the stellite would cause the friction coefficient to go down dramatically. So you can't use that friction coefficient; it's not reliable. So they have to go back and use the friction coefficients that the Joint Owners Group has shown that if you reach a plateau you are able to use that. And then after that, as long as you don't open

the valve up, once you open the valve up you have to make sure you are set at the adequate friction coefficient. But then you focus on alpha capability, because alpha capability can decrease over time through stem lubricant, changes in how your torsion features work and things of that nature. You need to monitor how your output capability of your in-load operator valve might change over the life. And that is part of what we test periodically to make sure that you can maintain that plateau friction coefficient for that particular stellite, that particular temperature, that particular application. So that is what they do over time.

CONSULTANT WALLIS: So it is tested over time?

MR. SCARBROUGH: Yes.

So and then the vendors, there was guidance in the procurement specs for the vendors, and we wanted to make sure it was clarified that they had to follow QME-1, and that is going to be clarified per the Westinghouse guidance.

There was some discussion in there about check valves. There was a series of check valves that didn't appear to be able to be tested with flow, and Westinghouse indicates they are going to revise the

design of this piping to be able to put in test connections so they can test those check valves with flow. So that was the result of that. That was an open, so we are on the success path for that.

For the second open item it had to do with --

CONSULTANT WALLIS: How do you test the check valve?

MR. SCARBROUGH: Put the flow through it and force it to move up.

CONSULTANT WALLIS: You actually do that?

MR. SCARBROUGH: Yes, and then they'll show the other way, making sure it goes back down.

So for the second open item, the motor-operated valves, there was discussion in the DCD regarding the testing that was done in terms of how it related to the JOG program. And there was a reference to the static testing, and the JOG program included static, but also potentially dynamic testing. If you are not able to maintain this plateau value for valves, there is a requirement in the JOG program for people who commit to it that there is a potential for performing dynamic testing over time. So that was something that they are going to clarify in the DCD.

MEMBER BLEY: Tom, can I ask you

something about the DCD? I know I asked about this the last time you were here, but I'm still a little bit confused. In Chapter 3 it talks about it gets to this point for POVs, but it says, see the next section for a discussion for developing the in-service test program. And you go to that section all it says is, see the previous section for the criteria that you need.

MR. SCARBROUGH: There was some confusion regarding the moving of some information back into another section.

MEMBER BLEY: This was in a changed part of it.

MR. SCARBROUGH: If there is something in particular that looks confusing, we'll be happy to try to clear that up.

MEMBER BLEY: I'll be glad to show you that.

MR. SCARBROUGH: Because there was more of that at one time. There was a whole reference back to something, and then what was missing was the fact that the 50.55(a) requirements include a direct verification program for motor-operated valves in addition to the stroke-time testing. So they had moved that to another section, and then it was a

little confusing to move.

MEMBER BLEY: Okay, so maybe they just lost the cross reference.

MR. SCARBROUGH: Yes, there is some of that. But I'll be happy, if there is something in particular, we'll be happy to get that fixed.

The third open item had to do with a reference, once again, it was a reference to QME-1, and they are going to include that in Section 3.9.3, which is the operability section, or the functional design qualifications.

Open item four had to do with the use of ASME code case OMN-1. That code case replaces the stroke-time testing of the OM code with diagnostic testing, exercising every outage and then diagnostic testing on a periodic basis. What that code case can do is, it can satisfy both the stroke-time testing and the periodic-verification requirements of 50.55(a). Currently the Revision 0 of the code case is accepted in Reg Guide 1.192. In Rev 1, which is actually an improvement, hasn't been through the process yet to be accepted in the reg guide, and so there was a discussion as to which version of the code case they are going to apply. Because if you are going to use the one that has not been accepted in the reg guide

yet, you need to justify an alternative to the code. And based on the latest discussions with Westinghouse, they are going to pull back and make sure they use the code case that is in Reg Guide 1.192, reference that. That way they don't need to include an alternative for that.

Now the R-COLA might decide to do something different, but that is what Westinghouse has indicated they can do.

The tech specs, the 05 open item was just that there was a couple of places where the references to the OM code was misrepresented in the tech specs, and that's going to be fixed. It was just a place where it fell back to the old boiler and pressure vessel code, to section 11, and that is out of date of the OM.

06 was -- in the RAI response regarding check valve acceptance criteria, we agreed with the acceptance criteria in terms of basing it on the full open, with the disk lifting fully, and design flow wherein valve closure with DP or stopping the back flow. But that wasn't in the FSAR. We can only base our decision on the FSAR, not an RAI response. As indicated that needs to be spelled out in the FSAR, and Westinghouse agreed to that and they are going to

put that in the FSAR.

For 07 it had to do with a note in Table 3.9-16, which is the IST table, which was, it was a little out of date. It sort of referred back to the old concept of MOV testing before the Joint Owners Group program came along. And it didn't mention the Regulatory Issue Summary of 2003, which is the power-operated valve guidance document. And so Westinghouse is going to update that note to reference the job program and the risk, so that's on track.

08, there was a table, the IST table had some a little bit of confusing, at least to me, regarding the reference the reference to fail safe testing and periodic verification. This is in verification testing. And Westinghouse agreed to clarify that, the IST tables are going to be revised to specify the fail safe testing along with the other IST testing. So that is on track.

09 had to do with the IST table itself. Once again there were several points in there that we were confused about. There was a reference to Appendix J testing for containment isolation valves, and it seemed to be a little out of place for an IST document, because that is a whole different set of testing provisions. And Westinghouse is going to go

back and edit that and be clear on that, so that is on track to be done as well.

Okay, so those are the AP1000 open items. And they are all on track to be resolved through the latest letter we received from Westinghouse on January 26th.

For the COL items we have letters from Southern Nuclear dated September 14th, 2009, and January 12, 2010, and they provide their plan response to these overnight. And we are apparently reviewing them, but it looks like we are on track.

First is the 01, the audit open items, and the R-COLA is going to look at the responses, how those resolved through the AP1000 open item, and then decide if they need to supplement that information with additional information. So they are waiting on that to get that resolved.

With respect to the second open item, that had to do with some provision to the FSAR. There was a reference once again to the ONM-1 code case, which revision was going to be used. And also there was a language where because the DCD and the FSAR merged together and there has been several revisions to both documents, there was a place where they didn't seem to mesh. And so we asked them to look at that, and they

are going to fix that and make sure that they mesh, the language meshes together.

03, and this is probably where there is the most work that needs to be done by the R-COLA. This completing the full description of the MOV testing program. And as you can see there are some areas that need to be addressed, and one is the ONM-1 code case which revision they are going to use. Make sure that the operating requirements and the output capability are adequately evaluated, and that can be done through the description of the job program implementation. The demonstration of design basis capability, how that is going to be accomplished. Justification for any extended intervals, and a successful completion of MOV acceptance criteria.

A lot of that is in the ONM-1 code case and in the JOG program, so by using that information they should be able to resolve this. But their plan is, their R-COLA indicated they are going to wait until Westinghouse resolves their open item on the MOV testing program and then supplement what they need for that.

Now the 04 item is on the POV testing program which are all the other power-operated valves other than MOVs, and actually there's a couple of

loose ends there. And you mentioned one of them in the earlier discussion. The high risk limitation that was mentioned there, they are going to remove that high risk limitation. That was not -- you have to do post-maintenance testing evaluation whether it's high risk or low risk, because they are all safety related in this program, so they have to do that. So they are going to take out that limitation that was there that sort of limited it just to high risk.

Also they need to indicate that their periodic dynamic testing might be required based on the valve qualification process, what you find in your qualification, and from operating experience. Both of those may dictate periodic dynamic testing as part of your POV, and they are going to clarify that as well. So that is going to be part of it.

05 had to do with flow-induced vibration monitoring. And this is an area that -- there are guidance provisions in the DCD in Chapter 14 in terms of the startup testing program for flow-induced vibration monitoring. Because of our operating history with flow induced vibration monitoring, even though it's focused mostly in Boiling Water Reactors and steam dryers, we want to make sure that this issue does not fall through the cracks somewhere. So we

want to ensure that flow-induced vibration monitoring is part of the startup testing program and they are aware of it. They provided their clarification in their response that we just received from the R-COLA, which indicates how they are going to implement those DCD provisions, so it looks like they understand what they need to do for that, so that's on track.

Open item 6 is once again the tech specs. So the tech specs just have to be cleaned up and make sure they reference the OM code properly.

So that is it for both 3.9.6, for the AP1000, and the R-COLA, so they are both on track to be resolved in the near future. 3.11, as it was talked about, 3.11 is the environmental qualification, and when we performed the AP1000 audit we also looked at some of the EQ aspects in terms of how for mechanical equipment for example QME-1 includes provision for, as a non-mandatory appendix for qualification of non-mettalics. And that's partly going to be pulled into the procurement specifications for the Westinghouse components. So we looked at that. Rather than closing out 3.11 prior to 3.9.6, we decided to link them together. But both of them should be resolved together, same time.

For the R-COLA 3.11 open item, once again

as Eddie mentioned that's a placeholder. But one thing we are going to be doing is making sure that there is a transition from the initial EQ to the operational EQ, because most of the initial EQ is done right up front, it's spelled out in quite a bit of detail in the DCD. And then that transitions over to the operational side, which includes surveillance and replacement intervals and things of that nature.

So what we'd be doing is just making sure that transition is clear from the initial EQ to the operational EQ, and then we'll be able to close that one out too. So that just takes a little more word. But other than that, that is on track as well.

So with that, that's my presentation.

CHAIR RAY: Okay, any questions for Tom? Any more questions for Tom?

My job, I've got to try and keep the trains running on time here. So I'm going to do that. But we are absolutely going to do Chapter 15.

MS. McKENNA: Yes.

CHAIR RAY: On time. I take it that the COL portions of Chapter 15 which are scheduled for tomorrow just couldn't be done today?

MS. McKENNA: That's correct. We'd be here until 6:00 o'clock and we thought that was

perhaps a bit late. Also I think you'll find that the COL portion that is almost -- it's very highly incorporated by reference, and there's not a large volume of new information on the COL side. So we felt that Member Banerjee would not be too disadvantaged if he didn't hear the COL part of Chapter 15, since I know he can't be here tomorrow. But we wanted to make sure that the gas accumulation was covered today, because I think that is of more substance, and we benefit from the discussion.

MEMBER BANERJEE: And I noticed you also put GSI-191 there.

MS. McKENNA: I'm sorry?

MEMBER BANERJEE: Is it correct that you are also going to include a status of GSI?

MS. McKENNA: Yes, we will give a status at the very beginning of our Chapter 15 discussion we will give you a status of where we are with the 191 issue.

CHAIR RAY: So before we take our break, there are two things I want to say. One was that, that no matter what we are not going to compress the Chapter 15 discussion in the schedule here. It will start not only after lunch, but it will start at 12:45. So that may mean that staff discussion of

Chapter 9 gets compressed; I'm not sure. We may defer part of it; I don't know.

The second thing is, on the subject that we did take a little time on and then I cut it off, I want to make sure it's understood that I didn't mean by doing that that it's not needing some resolution. I'm sure you noted, I'm talking about open item 3.6-1, and the issue here at hand that I want to close up this with before we take a break around 10:30 for 15 minutes is the following, and Terry, let me address this to you.

In the SER -- I'm really playing off something that Bill said -- it says in RAI 3.6.2-1 the staff requested the applicant provide a description, write a description, pertaining to the closure milestone of the as-designed pipe rupture hazard analysis activities. Okay. I've read that sentence to myself a bunch of times, and I'm not sure what we're asking for -- I'm going to ask you to address that, but I will in a moment. It goes on to say how the staff -- how the applicant responded, the applicant here being Southern Nuclear as part of NuStart. And then it says, however the applicant's RAI response addressed the as-put rather than the as-designed aspect. Therefore, RAI 3.6.2-1 remains

unresolved, and will be tracked as open item 3.6-1.

Okay, now the slide here doesn't convey that, whatever that means I didn't get it off the slide here very well. So I guess my question to then is, is there some requirement that this pipe rupture hazard analysis be done now as part of the -- I don't know whether I'm talking about standard contact or site-specific, to be very honest with you -- but when has it got to be done? Or when did you think it ought to be done, put it that way.

MS. SPICHER: The table we talked about previously is we had certified Rev 15, and in Rev 15 there is DAC.

CHAIR RAY: But as Bill said, we are talking about the COL now.

MS. SPICHER: Right. Well, in the DAC it is pushed off as a COL. So if we go back to that version we're okay.

CHAIR RAY: That doesn't help me very well when I read what's in the SER here now, which was, you asked them to provide a description pertaining to the closure milestone of the as-designed pipe rupture hazard design activity. So all you're asking for is a description of the milestone, description pertaining to the closure milestone.

Maybe this has to do with what Eileen said.

MS. COFFIN: This is, I think Renee, she talked to this open item.

CHAIR RAY: She did, and I'm asking you guys now.

MS. COFFIN: So from our perspective, as long as the staff understands the methodology, the acceptance criteria, exactly how they are going to go about designing their piping and doing the hazards analysis, we are satisfied that it be -- the inspection of the implementation of those aspects can be done after license issuance.

MEMBER SHACK: Let me say something, Harold. I think when that was written it was understood that this was going to be resolved as a design basis, so all the COL applicant would have to do is the as-built. Now since we are going all the way back, somewhere along the way, somebody is going to have to do the as-designed and the as-built. All those sentences are now inoperative because we are going to a step back from where we thought we were when we looked at that Bellefonte COL.

CHAIR RAY: Perhaps that's the explanation. I'm not sure.

MS. COFFIN: And I think one thing that

the staff is working with this design center was, in the coping DAC that was approved as part of Rev 15 we -- the separation between as-designed and as-built was not as clear as maybe we would have liked. The staff would like an opportunity to inspect as-designed, and then you have more standard inspections of looking at the piping runs and seeing that they are looking like the as-designed, or if there is a discrepancy then we can follow up as to the rationale for that discrepancy.

So that is another thing that Renee and her team are trying to work with the design center to make that distinction.

CHAIR RAY: Well, recognizing what Bill said, and I have to process that a little bit, but still seemed like all you were asking for was a description of the closure milestone for the as-designed piping, and what you got according to this was something about the as-built, so it wasn't resolved and it became and open item. Well, what the heck happened to that problem?

MS. LI: Well, let me address that even though you ask the project. When we first back in late 2006 working with Westinghouse all the time the approach is try to complete once piping design and

pipe break hazard analysis for this amendment certification.

CHAIR RAY: This is about the COL.

MS. LI: But --

CHAIR RAY: Just a minute, Ed.

MS. LI: So we thought that this would be resolved within the time frame of amendment review. However, on book, if you look at Amendment 15 there is a COL item about completing our piping design and also the pipe break hazard analysis. So when we review the benefits at that time, we have to -- it's identified in the FSAR as stand-up COL item. However, as time proceed there is no clear or firm commitment that when this analysis would be complete for post-piping and pipe break hazard analysis.

CHAIR RAY: I understand that perfectly. I'm trying to understand what you wrote her.

MS. LI: Right, because Reg Guide 1.206 Section 33.43 says if a COL applicant cannot complete the COL information prior to issuance of the license, COL license, then they have I believe it's four provisions -- four options that either they can resolve the issue through ITAAC or through -

CHAIR RAY: I'm sorry, we're out of time, we have to stop. I don't understand --

MR. CUMMINS: Can I make one comment?

CHAIR RAY: Yes, let me let Ed speak first, because he had his hand up.

MR. CUMMINS: So I think that if we had been successful and finished the piping analysis and the pipe hazards analysis, either it has been resolved in the design circuit. So if I was a COL applicant and you asked me how was the pipe hazard analysis design going, I would say talk to Westinghouse, because if they are going to close it, it's in the realm of design circuit. If they are not going to close it, then it is in the realm of COL because it's left over. And we intended at the time to close it, so --

CHAIR RAY: I guess I'm asking a too narrow question, Ed, and again, I'm out of time, I've got to move on. But this only asks for a description of the closure milestone; that's all it asks for. And I'm just trying to find out why when you didn't get it that was okay, and I heard Renee's explanation. I can't say I understand it. I'm going to quit now because I just don't have time to pursue it.

Yes, sir.

CONSULTANT WALLIS: I think the question for the ACRS is does the ACRS have any role in

resolving this pipe rupture question, or is it just going to be something that the staff is going to work out somehow or other. And we don't have any role.

CHAIR RAY: Well that I think goes more to the question of DAC, which the ACRS role in the resolution of DAC is an open item, and that is where I stopped Charley to begin with. We are not going to try to resolve that here now.

MS. LI: Yes, but the SER when it says, approach a milestone, I think it should say to allow coordination of NRC staff's inspection and construction activity. So we are asking that when you think you provide us so that we can come to audit.

CHAIR RAY: Okay, like I said you can read the SER itself. I don't think what is written in the SER is explained by any of the discussion we just had.

With that we are going to adjourn. We are not going to adjourn, we are going to take a break. And because I am very concerned that we are now half an hour late and I am wanting to get our agenda done today, I'm going to ask everybody to come back at a quarter till. That's a short break, I understand. But I don't have any choice.

(Whereupon at 10:36 a.m. the proceeding in

the above-entitled matter went off the record and resumed at 10:45 a.m.)

CHAIR RAY: So let's resume, and we are ready for Chapter 9, beginning with Amy, I guess you.

MS. AUGHTMAN: Yes.

CHAIR RAY: Please.

MS. AUGHTMAN: Again, Chapter 9, standard content for the COL application FSAR.

As I just indicated we do have a couple of SMEs joining us by phone from Intercon, Juan Vizcaya and also Phil Kwok.

MR. HIRMANPOUR: Phil Kowk.

MS. AUGHTMAN: Kwok. And with us here at the side table for fire protection is Gary Kantner. And the presentation will be given by myself and Bob Hirmanpour.

CHAIR RAY: Okay.

MS. AUGHTMAN: So again using the color coding system we are planning to cover the sections listed in blue, and for standard content. We have incorporated the DCDs with no major departures. The only standard departure that is taken here is with respect to numbering of the sections in order, and how those are priced relative to how the DCD is organized.

Just to point out again Section 9.2 is all

plant specific so we will not be touching on water systems today.

For standard supplemental information we'll be covering the load handling program, and part of that is also addressed by COL items. And again that program is based on NUREG-0612 and vendor recommendations.

So for the COL item discussion I'm going to turn that over to Bob Hirmanpour.

MR. HIRMANPOUR: Good morning. I'm Bob Hirmanpour with NuStart Energy.

As Amy we are only going to cover the standard items. The majority of the Chapter 9 information is actually related to water systems. But DCD is incorporated by reference so most of the COL items are related to programmatic aspects of those systems or ancillary systems.

The first item is called item 9.1-5, which is in-service inspection program of cranks, basically I have information in the FSAR that we will provide programmatic controls to administrative procedures for inspection and testing of the cranes, and part of that is following NUREG-0612 to identify the load paths and also listing of the cranes. Also we have the QA requirements per NUREG-05544.

There has been also some recent operating experience related to cranes that we have also considered.

Next item is COL item 9.l-6. Again that is the commitment that we made in the FSAR any machine handling fuel we will have already a monitor installed while it's in use. Any question on that slide?

COL 9.1-7, that's a metamic monitoring program. Again, DCD covers the metamic monitoring which identifies the numbers of coupons, surveillance requirements, and provides over the next 40 cycles defines when you are going to do the testing. So the SR information is related to how we're going to do testing and establishing your program and checking for items like blistering, cracking, based on the operating experience.

Any question on that program.

Continuing to COL item 9.3-1, that's the air handling system. Again, that was one of the major issues identified by the NRC. In the early `80s because of the instrument air failures there was Generic Letter 88-14 issued and NUREG-1275, against in the FSAR we have committed to follow the program for the air system, the compressed air system, for the

training for design and for the inspection, per the Generic Letter and the NRC guidance.

MEMBER ARMIJO: Just go back to that metamic. Now this is a newer material. But if they had proposed to use a conventional boral material, you would still have a monitoring program of some sort.

MR. HIRMANPOUR: Absolutely.

MEMBER ARMIJO: Is this pretty much the same kind of monitoring program you'd have on any kind of a material application?

MR. HIRMANPOUR: That is correct, and the items we inspect for and test for is based on the past experience. Of course we expect the metamic to do much better, since they are the best of the best.

Okay, next item is the HVAC systems. Again the COL item 9.4-1 has two aspects to it, as 9.4-1a and 1b. 1b is plant specific, but -1 goes back to prophylactic requirements for the HVAC for testing, and there are a number of the ASME codes and standards we follow including HE-1, N509 and N510, and all of these have been endorsed by the NUREG 1.140. And are reflected in the FSAR. Any questions on that slide.

We are now going to put this back on schedule.

CHAIR RAY: Much appreciated.

MR. HIRMANPOUR: And 9.5-1 actually the next two slides have to do with the fire protection. Again the fire protection and fire hazard analysis, Appendix R, all that, are considered part of the DCD, so the major section of the DCD actually dedicated to fire protection. FSAR again takes out the programmatic and administrative aspects of the fire protection. 9.5-1, we have about 10 pages of FSAR talking about the fire protection program. Again those are generic administrative, the qualification, training, organization, the fire brigades. Our fire team members will meet and achieve the FCBA The FSCBA, all of that are covered within the overall program.

9.5-3, the regulatory conformance, the FSAR Table 9.5-201 provides the comparison with the Branch Technical Position 9.5-1, that's CMEB 9.5-1. And basically indicated it complied with that. The only exception we have taken is about four or five NFPA cores that have been superseded. So we are using the newer NFPA coats.

MEMBER STETKAR: Can I ask you a little bit about that table? There are a couple of items on that table that address program elements for fires that -- I'm trying to get the right quote here --

manmade site-related events that have a reasonable probability of occurring at a specific plant site.

And the remarks section in that table 9.5-201 simply says subsections 2.2.3 and 3.5 establish that these events are not credible. I looked at those sections of the DCD and they are simply descriptions of the turbine and general site features. I was curious what basis you used, since this 9.5-201 is your table as the COL, is determining the incredibility of whatever these non-described events are.

MR. HIRMANPOUR: Okay, I'm going to refer that to our fire protection expert, Gary Cantner.

MS. AUGHTMAN: Well, actually if I could interject real quick. I think what you are getting at is, really we are referring to the FSAR sections.

MEMBER STETKAR: I am referring to your COL Table 9.5-201.

MS. AUGHTMAN: Right.

MEMBER STETKAR: So this is your scope.

MS. AUGHTMAN: And so the sections that are in the remarks column would actually refer back to the FSAR.

MEMBER STETKAR: I can't refer to the FSAR, because your COL FSAR doesn't have those

sections in it. I couldn't find a 2.2.3. So I looked back in the DCD thinking that perhaps it referred to the DCD sections, and I find any kind of substantive guidance to lead me to a determination of incredibility. So I'm now confused about where the supporting analyses is to support this incredibility. Not credible means it can't happen as far as I'm concerned, and that is difficult to justify for a lot of things. Perhaps you can, but "m curious how it is justified.

MR. HIRMANPOUR: Gary.

MR. CANTNER: I'm Gary Cantner, Emerson Services, representing NuStart.

Actually the item in the table says, credible events affecting more than one reactor unit, and I can't really speak on the sections 2.2.3 and 3.5, but --

MS. AUGHTMAN: Those are site-specific evaluations, and discussions, that are in the FSAR. Now for Vogtle those probably occur more in the ESBA site safety analysis report, which is incorporated by reference. So some of the details that you may be looking for could have already been reviewed as part of our ESB application.

(Simultaneous speaking)

CHAIR RAY: Okay, well wait a minute.

MEMBER STETKAR: This is not the standard COL. So we are reviewing this right now for you and for in principle any COL in the future. Not the Vogtle ESB in particular.

MR. HIRMANPOUR: Okay, let me take that question and I'll get back to you later today.

MEMBER STETKAR: You have to get back to the whole subcommittee, not one member.

MS. AUGHTMAN: If I could request, is it item #15 that you are looking at?

MEMBER STETKAR: Items 15 and 22 in particular if you want the reference to go back, because both of them address -- one of them says multiple units, the other one is not clear that it applies to multiple units; 22 doesn't seem to have the multiple unit connotation. But it's almost 15 and 22 in that table, and they both use the same justification.

MR. HIRMANPOUR: I will get back to you later today or tomorrow anyway on those.

MEMBER STETKAR: Thanks.

CHAIR RAY: That's fine.

MR. HIRMANPOUR: Okay, 9.5-5, again, that is the compliance with NFPA codes, tables. 9.5-4

provides our compliance with NFPA codes and the only exceptions not in that table was like for the intake structure that we say we don't need the fire sprinkler for the intake structure since it is all masonry and there is no safety related equipment in there.

MEMBER ARMIJO: What intake? The water intake?

MR. HIRMANPOUR: The water intake structure.

(Simultaneous speaking)

MR. HIRMANPOUR: -- take exception to it.

MEMBER ARMIJO: Got it.

MR. HIRMANPOUR: There may be other exceptions to an NFPA code that are included in the DCD from the core offsite and the programmatic level, the software.

And 9.5-6, that is verification of field installed fire barrier. Again, we have added and test and inspection requirement to inspect those. Also we followed the NFPA guidelines on the regulatory guidelines on how often you inspect them, and also doing the maintenance if you either do open or automatic closing doors, all those requirements again are described in the FSAR.

Any questions on that slide?

Okay, that last item in fire protection is 9.5-8, which is again establishing procedures. And those procedures again are described in the FSAR. 9.5-11, that's the security communication.

CONSULTANT WALLIS: I don't understand what you mean by procedures to minimize risk. That seems a rather -- do you mean it in a qualitative sense?

MR. HIRMANPOUR: The fire protection program basically goes back to fire prevention, part of that is combustible loading, all that stuff, as part of the fire protection program. We will be able to calculate the risk of fires in the area, and we try to minimize those. One of those decisions we talked about.

CONSULTANT WALLIS: To minimize you have to have something that is a function of various things and you have to twiddle those things in order to get the minimum value of something.

MR. HIRMANPOUR: Yes.

CONSULTANT WALLIS: I don't think that's what you mean. I think you are reducing risk as much as is reasonable.

MR. HIRMANPOUR: That is correct.

CONSULTANT WALLIS: There is no risk metric involved.

MR. HIRMANPOUR: No -

(Simultaneous speaking)

MR. HIRMANPOUR: 9.5-11 security communication, FSAR is short on that point, it refers to the physical security plant. So if you have any questions on that we have to defer that until later; we can't talk about this Safeguards information. And 9.5-13 is a fuel degradation protection. That is a diesel fuel. Again, in the FSAR, we have committed to use ASTM with grade 2D, and also we have the inspection and testing. There has been many operating experiences, I would say `70s and `80s, related to the diesel fuel. We have incorporated those into FSAR, and we are using the latest ASTM standards for inspecting.

CONSULTANT WALLIS: Is there a temperature, minimum temperature requirement, for the diesel fuel?

MR. HIRMANPOUR: I'll have to get back to you on that one. I know we check for -- we do periodic tests for wire, for color, and particulate, temperature I do not recall.

CONSULTANT WALLIS: Fuel becomes wax at

certain temperatures.

MR. HIRMANPOUR: I will have to look at the ASTM table, because we do incorporate the ASTM testing requirements.

CHAIR RAY: Okay, please check on that.

Before you go on to the next slide, let me ask, Stephanie, do you know, or maybe my more experienced peers can tell me the answer to this, how do we get done whatever we need to do with regard to the security communications up here?

MS. COFFIN: The—so when we come back to this group to discuss Chapter 13, I think it's 13.6, security reviews, we will touch on this particular item as part of that review. Right now there is essentially just a pointer to 13.6.

CHAIR RAY: There is essentially what?

MS. COFFIN: A pointer in the SER I believe to 13.6.

CHAIR RAY: I see, okay.

MS. COFFIN: So it's really reviewed by our physical security staff.

CHAIR RAY: Yes, I knew we weren't going to do it now, but I just wondered how it got done.

MS. COFFIN: When we come back to Chapter 13, that will be when.

CHAIR RAY: Okay.

MR. HIRMANPOUR: And so I will get back to you on the temperature guide. We do follow the ASTM D975 table one that it is all the parameters that need to be tested. And I've done the COL items.

MS. AUGHTMAN: All right, so off the cuff it would be open items we have for this chapter, and the first one is 9.1-1 on the metamic monitoring program. The staff received clarification that we would in fact be using the number of coupons and the withdrawal schedule as was stated in the DCD. So we provided that confirmation. In addition we provided a license condition to provide a schedule for the metamic monitoring program in the form of limitation milestone.

The second open item has to do with the light load handling system inspection implementation. We provided a commitment to include an inspection of that system prior to fuel receipt. And then similarly for the overhead heavy load handling system we have provided a commitment to implement that program including system inspections prior to fuel receipt. So 9.1-3 actually goes along with open item 9.1-4. We've potentially responded to those open items in the 9.1-3 open items.

And then open item 9.2-2 actually related back to a Chapter 12 open item. We're potentially tracking closure of the Chapter 12 open item which was related to the raw water system and how the site procedures for decommissioning records would be maintained in accordance with 20.1406. So since we've now closed open item 12.3-1, we believe that also closes open item 9.2-2.

And that's all we have planned for Chapter 9.

CHAIR RAY: All right, you picked up 10 minutes for me. Thank you.

MS. COFFIN: Okay.

(Comments off the record)

CHAIR RAY: You are up, Stephanie. You got anything to say.

MS. COFFIN: No, I'll just introduce Tanya Simms. She's Chapter 9 project manager.

MS. SIMMS: Good morning, everyone.

Thank you for having this. We are presenting standard content for Chapter 9. So we are going to through -- that's already been explained previously.

This is a list of the staff review team members. But today we have five of them presenting.

We have Mr. Jeff Poehler, who will be presenting the first slide, and other sections of 9.1 We have Mr. Gordon Curran, Nan Chien, and then as come up and finish with their presentations, we'll have Mr. Thinh Dinh and Gregory Makar come up to do their presentation.

CHAIR RAY: Very well.

MS. SIMMS: Standard content takes place in Chapter 9. Those sections relate to fuel storage and handling, of which we will be discussing the metamic monitoring programs, light load handling systems, overhead heavy load handling systems.

The other sections that will not be discussed because they are site specific is the water system, process auxiliary. We will have standard content that is available inside of air conditioning, heating, cooling and ventilation systems, and we have standard content that is inside of the other auxiliary systems in 9.5. We will be discussing the fire protection program and the diesel generation fuel oil system.

We have four open items as was previously stated from the applicant. They went over those items. What we will do at this time is have our presentation and the staff's review of those sections

and of the standard content. We will begin with Mr. Jeff Poehler and the standard monitoring program.

MR. POEHLER: Thank you, Tanya. I'm going to be talking about the metamic monitoring program, and specifically open item 9.1-1 concerning that program.

For those who aren't familiar with it, metamic is an aluminum-based metal matric composite material which contains boron carbide to absorb neutrons. It's being used in the AP1000 spent fuel racks to provide additional criticality prevention margins.

There is a metamin monitoring program. It's called out by actually the information item 9.1-7 from theAP1000 DCD, and they took our corresponding standard COL 9.1-7 in the COLs and that COL -- standard COL 9.1-7 specifies the coupon surveillance program for the spent fuel pool neutron absorbing material.

And the reason for that, the reason we need a surveillance program as has been touched on before is there is pretty limited service experience for the metamic. It's been licensed for a few operating reactors, but the test data from their coupon programs really hasn't come in yet, or been

seen by the staff. It's all been within the last couple of years that they've installed it.

So what the DCD specified about the metamic is, certain aspects of the program including the type and number of coupons, recommended withdrawal schedule, and some of the attributes that have been tested, also include things like dimensions of the coupons, how they are installed in the pool.

It did not include the test methods and programmatic controls for the program which were left to the COL applicants by means of the COL information item.

So initially -- well, when we reviewed standard COL 9.1-7, it was basically -- what the COL include was a restatement of the COL information items. So there was really on additional information provided, so that's why we initially we had an RAI, and now an open item. And basically what the open item is asking for is four things: whether the number of coupons and withdrawal schedule would be the same as described in the DCD. Secondly, the methodology and acceptance criteria for the tests that are going to be performed with the metamic coupons. Third would be the corrective actions if the acceptance criteria aren't met. And finally the administrative controls

applicable to the program.

With that I'll take any questions.

CHAIR RAY: I understand the response has been agreed upon by the applicant.

MR. POEHLER: We are still reviewing the response to the open item.

CHAIR RAY: I mean it's not a contested open item. It's an open item in that it hasn't been closed at least.

MR. POEHLER: That's right.

CHAIR RAY: The applicant agrees to provide the information.

MS. SIMMS: The next section we have is on the load-handling system, and we'll have conversation and discussion with Mr. Gordan Curran.

MR. CURRAN: Okay, my section is on the load-handling system. And there is a COL item that the applicant was responsible for the program for in-service inspection, and the heavy-load handling program. And the applicant committed to develop the program and the in-service inspection and provide the details of what would be in it. The open items were that there was no timeline milestone that was indicated in their response. So the staff of the applicant provided a response indicating that this

would be provided prior to the load and that is under review right now.

The second item that I have is on rad monitoring. And the COL item is that the rad monitor should be monitored on any frame-handling fuel. And the applicant had stated that the plant procedures require the monitors be mounted on any machine, and there are no open items with that.

Any questions?

MS. SIMMS: The next section will be a discussion by Mr. Danny Chien on the ventilation system.

Danny.

MR. CHIEN: Okay the ventilation, SAI 9.4, as Brian mentioned, DCD asked the applicant to specify his own program. And the reason applicant needs to talk about this is, this ASME AG-1 is very important for safety function. So specific cause to ask applicant to adjust their program. Now every applicant needs to specify this standard and follow it. That's why it is there. Any questions?

MS. SIMMS: Are there any questions?

CHAIR RAY: None.

MS. SIMMS: The next section is on other auxiliary systems for 9.5. We'll have the image that

is up here go to the side and have Mr. Thinh Dinh and Gregory Makar come up for those presentations.

CHAIR RAY: Thank you.

MS. SIMMS: For the fire protection section we will have Mr. Thinh Dinh and have that presentation.

MR. DINH: Yes, the objective of the Fire Protection System is to minimize the probability of occurrence and also the consequences of fires that can actually occur at the plants.

CONSULTANT WALLIS: Does this mean that you calculate the probability of occurrence?

MR. DINH: No, we don't.

CONSULTANT WALLIS: So how do you minimize it?

MR. DINH: That's the second bullet. We provide a system of defense in depth that use administrative controls, fire protection system features, and redundant safet-shutdown system to make sure that --

CONSULTANT WALLIS: There isn't a measure of success?

MR. DINH: It's defense in depth, so it's not really a measure, a calculation.

CONSULTANT WALLIS: It says the things

that you do but it doesn't evaluate how effective they are?

MR. DINH: Based on the current operating fleet, I think we have a pretty good success program for protection of fire at the plant. And to mitigate those fires that occur.

Okay, the regulation and guidance, we use 10 CFR 50.48, Fire Protection; SRP 9.5.1; Reg Guide 1.189, which is the bulk of our requirements. It's a regulatory guide, but it's -- we consider it as a requirement. If they meet that they will meet the fire protection requirement.

And also --

MEMBER STETKAR: Those are basically deterministic fire protection requirements to follow up on Graham's question.

MR. DINH: Yes, that's correct, thank you.

And also, enhanced fire protection for the SECYs 90-0-16, 93-087, and 94-084.

The staff 14 RAIs for the standard contents, based on Reg Guide 1.189. And the applicant largely revised the COLA to address those, those issues. Except for one which we identified which is not in conformity, 1.189, which is the safe shutdown

analysis methodology. Traditionally the safe shutdown analysis is part of the fire-hazard analysis, and it's including equipment and cable routing information, and it is usually in large volumes of analysis.

Based on the design of the AP1000 the applicant asserted that it's not required in detail, the component and cable analysis is not required, because the plan is separated by three-hour barriers. Throughout the plants the redundant trains are separated. And also there are appropriate procedures in place to identify any standard design deviations that may occur during construction that violate that separation. And also by law they are required to identify and address those deviations.

And to further evaluate that assortment we also performed two audits of the functional analysis calculation. And based on our review of the plan layout drawing and the review of the calculation analysis we determined that it's adequate for now. But they committed to include the as-built information as the plant is built.

MEMBER STETKAR: This will become a COL-specific item?

MR. DINH: Yes.

MEMBER STETKAR: To demonstrate final compliance with as-built?

MR. DINH: That's correct. It will be a living document maintained by the COL applicant throughout the life of the plant.

MS. SIMMS: The next section we have is the diesel generator fuel oil system, and that will be discussed by Mr. Gregory Makar.

CHAIR RAY: Before we leave fire protection let me just pursue that a little bit further. So the Reg Guide from 1.189 was basically set aside and specific review was done of the standard content information relative to fire protection; is that fair?

MR. DINH: That's correct.

CHAIR RAY: What do you foresee, is that likely to be the case not just for the AP1000 but for other new plant designs, the 1.189 isn't suitable or applicable guidance?

MR. DINH: Well, 1.189 has a guidance that says that safe shutdown training should be separated and maintained. It doesn't go into detail exactly on how you do it. But traditionally what the current fleet does is having an analysis, because they don't have perfect separation. So they have to keep

track of all the component cables from different trains, to make sure they are separated, or do something to ensure safe shutdown is achievable.

But for the new plants, since the design is laid out such that everything is separated as much as possible except for the containment and the control rooms.

CHAIR RAY: Okay, well, I'm just keying off of your statement here in the slide that the standard content fire hazards analysis is not in accordance with Reg Guide 1.189. It sounds like you are telling me, well, it really is, it's just that it's in accordance with it because it provides for this three-hour fire separation except maybe in a couple of cases.

MEMBER STETKAR: Maybe you could help me. Reading your slide there I understood the slide to say that the fire hazards analysis, the plant-specific fire hazards analysis where you go from compartment to compartment and look at safe shutdown paths and so forth has not been performed according to the way that it is traditionally performed for the existing operating fleet. But the AP1000 design conforms with basic criteria in 1.189, doesn't it?

MR. DINH: The fire hazards analysis is

actually two parts. One is the area by area, and they list all the safe shutdown components in there and the fire protection features in this area. But also have another section where there is a safe shutdown analysis, which would keep track of all the cable routings and everything.

For the AP1000 since they have good separation it is not really necessary, because if they are going to do that, all they do is say okay, everything here is Train A, and everything there is Train B.

So it doesn't really add any value for just listing those cables and keep track of them throughout the plant.

MEMBER STETKAR: The other basic elements of 1.189, in terms of separation and protection of a safe shutdown --

MR. DINH: Right, it is covered.

MEMBER STETKAR: -- are covered, okay.

CHAIR RAY: Okay, and your point about this living document that is a consequence of a review, is what? I guess -- what is the role -- I guess it's like the security plan or something like that.

MEMBER STETKAR: If you install new

cables for example and bore a large hole in the wall between the division between Train 1 and Train 2, you want to make sure that either it's resealed or you somehow account for that fact.

MR. DINH: And you don't route a Train B cable into Train A.

MEMBER STETKAR: Right, modification of the plant doesn't inadvertently route a Train B cable through a Train A area or something.

MEMBER BROWN: I just wanted some information, the three-hour separations, the question I was going to ask was relative to cables. You've got components, pumps, pipes, valves, et cetera. And yet what I'm taking out of the conversation y'all just had -- this is an education question -- is that you maintain that same separation for all cables associated with that, cables, switchboards, power supplies, what ever sources, switches, actuation, that's all separated by this three-hour barrier?

MR. DINH: Yes, right.

MEMBER BROWN: So you've got three hallways worth of stuff, and there's a switchboard with power coming from outside that comes into that that is not going to be subject to some internal fire, is that right?

MR. DINH: Except for the containment and the control room.

MEMBER BROWN: There was some place at which all this comes together.

MR. DINH: For the control room we have an alternate shutdown panel which is totally separated from the control room.

MEMBER BROWN: And what do you do in the containment?

MR. DINH: Containment, spatial separation and shielding.

MEMBER BROWN: But not walls, necessarily?

MR. DINH: No.

MEMBER BROWN: I understand. I just wanted to make sure I understood. Okay, thank you.

MS. SIMMS: Are there any other questions?

CHAIR RAY: No.

MS. SIMMS: Thank you, Thinh.

Gregory.

MR. MAKAR: Okay, thank you.

I'm going to explain the COL information requirement for the COL information requirement for the diesel generator fuel oil system, and then

describe the information they provided and our review of that information.

Since these diesel generators are classified as Class D non-seismic systems, that means the functionality and integrity for these components are according to standard industrial assurance, industrial quality assurance standards. And based on their contribution to defense in depth, and to the performance of safety related passive systems, they are also identified as non-safety systems that require regulatory treatment or RTNSS.

MEMBER BLEY: Let me ask you a question. Do we have any idea at this time exactly what the hardware will be? Although it isn't seismic and safety-related, are they actually going to be different machines than we'd see in a plant where they are in fact?

MR. MAKAR: I don't know.

MEMBER BLEY: We just don't know what they'll be yet.

MR. MAKAR: I don't know. It may be -- I'm not up to speed on how they are described in the DCD. With my familiarity with the DCD I don't expect them to be different than what's -- substantially different from what's out there now.

MEMBER BLEY: I'd be really surprised.

MR. MAKAR: So the RTNSS system, the quality requirements --

CHAIR RAY: Excuse me, I'm sorry. Ed, did you want to say something?

MR. CUMMINS: Well, the building design is sort of based on the diesel, we based our building design on Caterpillar four-megawatt diesels. And let them put those words in the -- but that's what we plan to be using.

CHAIR RAY: Thank you. Go ahead.

MR. MAKAR: So the quality requirements for these RTNSS systems are described in Chapter 17, this is the DCD, under the design reliability assurance program. And the basis for that program is the providers body of evidence and experience. So with these classifications and the RTNSS classification, that gets us to manufacturers' recommendations, and industrial standards.

Now continuation with this background, based on the RTNSS evaluation performed by the designed, the operability of the diesels is addressed in the investment protection short term availability controls. And these controls look like tech specs in that they have actions, completion times, conditions.

And these controls address the fuel quantity but not fuel quality. So there is a requirement for AP1000 applicants to provide, number one, information to address the fuel specifications and properties consistent with the manufacturer's recommendations, that's the manufacturer of the generator, not the fuel; and to provide a program for the fuel to protect against fuel degradation.

So address fuel properties, address fuel degradation. That's the COL information that is needed. Next slide, please.

CONSULTANT WALLIS: Well, fuel degradation involves presumably controls on the amount of water that can get into it by intermittent condensation in the tanks?

MR. MAKAR: Yes, that's one parameter.

CONSULTANT WALLIS: Changes in its properties if it gets to a very cold region in its piping?

MR. MAKAR: That's another, yes.

CONSULTANT WALLIS: It's not just the fuel itself; it's the environment, and everything that could affect it?

MR. MAKAR: That's right. And specifically there is a -- oh. Now, although the

AP1000 in this regard doesn't conform to our guidance specifically, the SRP Section 9.5.4. We did use the guidance that is applied to safety-related diesels as a measure of this program you see for evaluation.

SOP Section 9.5.4 refers to a Reg Guide 1.137, and that is related to fuel quality and testing. And in that Reg Guide we have references to certain industry standards -- NASE International American Nuclear Society, ASTM International. That is where the technical details are for this, for the fuel properties.

As Mr. Hirmanpour explained, they are addressing this by specifying in standard COL item 9.513 that the fuel will be ASTM Grade 2D, and it's also going to have separate content specified by the engine and manufacturer.

And the COL information includes a description of the program which is based on meeting the requirements for the key parameters in ASTM D975, and ASTM D4176 for clear and bright appearance.

D975, that is the -- that is an ASTM standard for fuel oil quality that is in our Reg Guide 1.137. ASTM 4176 is not directly referenced in the Reg Guide. It is an acceptable method within our -- one of the other industry standards in the Reg Guide.

So together with this testing and the sampling for water, we have something that is very much like the program that is in the tech specs for safety-related diesels.

We did request some additional information related to the implementation of the program, since it's not in the tech specs, and the applicability to both new and stored fuel, and the applicant did clarify that it applies both to new and stored fuel and explained how it's implemented through Chapter 17 of the FSAR. And so therefore they have addressed both points, the specification of the fuel and the program for protecting against degradation.

MEMBER STETKAR: Greg, this is more of a programmatic, general programmatic question. But since we have five minutes here I can ask it.

You said that because the diesels are not safety related they are RTNSS equipment, and they are governed under the RTNSS controls and Chapter 17, the FSAR. What type of regulatory oversight is there of those controls? In other words if I'm a licensee and decide five years form now that I want to use a different fuel or not comply with certain elements of the fuel quality program does the staff get involved with that decision? I mean I understand the

commitments at this point in the game to require those requirements, but I was just curious how the staff in terms of the oversight process is involved with that.

MR. MAKAR: I'm not sure exactly how that works. I think that is something open to our -- the implementation of the quality assurance program is open to our inspections on site.

CHAIR RAY: We have no control on --

MEMBER STETKAR: That's what I was going to say. I was just curious.

MS. McKENNA: To briefly answer, Eileen McKenna here, the section the availability controls is in the DCD 16.3, which ends up in the COL FSAR through the incorporation by reference, so then it is now part of the FSAR and it is managed like other FSAR commitments if they wish to change them, there's a process they go through that.

MEMBER STETKAR: Okay, thank you.

MS. SIMMS: Are there any other questions?

CHAIR RAY: Apparently not.

MS. SIMMS: That concludes our presentation.

CHAIR RAY: Good. All right, we're down to 11 minutes now, let me preview -- yes, please, go

ahead. You have to use the microphone and identify yourself please.

MR. HIRMANPOUR: Bob Hirmanpour with NuStart. Do we have time to address the temperature question?

CHAIR RAY: Yes.

MR. HIRMANPOUR: Basically as I stated before FSAR does not talk about the temperature requirement. That temperature issue is one for the periodic temperature monitoring. We don't have a requirement for that. However as the input that I mentioned earlier they do talk about taking the temperature when you do sample for the new fuel. The fuel that has been stored at -- again, it depends on the type of the test. Solid test you do not need the temperature, a solid test, like a cladding temperature becomes important, because the temperature is too high, you will not see any kind of flash droplets in there.

CONSULTANT WALLIS: So is there a requirement for the fuel in order for it to work in the generator properly that it not get too cold?

MR. HIRMANPOUR: There is no requirement in the FSAR, in the licensing basis to monitor for that. However, when we do specify the fuel, which is

the Grade 2D part of that, it requires that you specify for the region of the country and all the environment or conditions are considered.

CONSULTANT WALLIS: Year round?

MR. HIRMANPOUR: Year round, right, and also your 92-day test.

MR. MAKAR: If I could add to that, one of those critical parameters in Table 1 of that ASTM D975 is a low temperature flow test, and that is region-specific, to be worked out between the supplier and user.

MR. HIRMANPOUR: And your periodic 92-day sampling test, those are verified and include the viscosity.

CHAIR RAY: Okay, I think that takes that item off of our list.

Okay, we are going to resume at 12:45. It will be closed session at that time, according to the agenda, and we will go as long as we need to in closed session. We will then take a break and we will have an open session on Chapter 15.

Closed session means what I read in my prepared remarks at the beginning of today, that everybody in attendance must be in addition to the ACRS and its staff and agency staff, must otherwise be

under a confidentiality agreement with the applicants, and so like I said we will begin promptly at 12:45 with that and go as long as we need to, and then take a break this afternoon. We want to be sure that we try to get everything that is valid to Chapter 15 covered during that time, and I presume we will.

Anybody, any member have any comments they'd like to make before the break, either about this morning? We will hold on to this issue of the pipe break as illustrative, and perhaps also warranting itself a further discussion. We had some useful clarification I thought, but it's still a little unsure how significant I think the subcommittee members feel about our ability to revisit the resolution regarding pipe break analysis or what is the basis for proceeding beyond this point with the licensing.

So we'll try and come back to that. But we have a whole list of action items that we are keeping track of now. They're grown over the three meetings and they will probably grow a little bit at this meeting too, and we want to go through to make sure all the members are satisfied with the action items we are working, and try and work them off as rapidly as we can.

Okay, anything else? We will resume here in closed session.

(Whereupon at 11:38 a.m. the above-entitled session went into closed session to reconvene in open session at 4:02 p.m.)

CHAIR RAY: GSI 191.

MR. DONNELLY: Yes, if I may, over here.

My name is Patrick Donnelly. I'm the project manager for the Chapter 6 DC Review.

And there are two questions that we wanted to clear up. We think they have been asked and we are not sure if they've clearly responded to them.

The first is, is it possible to approve the design of the sumps when the resolutions for operating reactors as far as GSI 191, if that has not been resolved, can we answer, or can we come to a conclusion. And our response is yes, we believe that we can.

And the second question that we are not sure --

CHAIR RAY: Excuse me, is that the same thing as saying this amendment application can be approved without resolving GSI 191?

MR. DONNELLY: As far as operating reactors, if GSI 191 hasn't been responded to for

operating reactors, can we come to a resolution for AP1000? Does that make sense?

CHAIR RAY: I think that's what I tried to say. I said, can we approve this amendment without resolving GSI 191?

MS. McKENNA: I think the clarification we're trying to make is, we have to resolve it for AP1000; we don't feel we have to resolve it for the rest of the reactors.

CHAIR RAY: I get it, but can we approve this amendment without resolving it for AP1000? And the answer is no. That's what I took away from reading the SER also. Okay.

MR. DONNELLY: Okay. And if everyone is okay with that, I don't know if we need to answer the second question, which is, how can we do that.

CHAIR RAY: Well, just need to read Section 6218 of the report, right?

MR. DONNELLY: Yes, right. So this will be addressing GSI 191 in the Chapter 6 review.

That should be available this summer. We intend to get it to you in June and then discuss it in July.

CHAIR RAY: Okay, that does clarify the issue, because we had hypothesized earlier that -- in

fact I think Ed agreed with my hypothesis that this amendment could be approved without resolving GSI 191. And in that context I meant it for AP1000. The answer is no, it'll be resolved for AP1000. You and I discussed this, Sanjoy, at some point. So we'll look forward to that.

Okay, any comment from Westinghouse? Okay, fine, let's proceed then with Chapter 15 SER.

MS. CLARK: I'm the project manager for Chapter 15, I'm Phyllis Clark, and for the next hour we are going to be discussing the staff's review of the safety analysis and the radiological consequences review.

Technical staff -- the technical staff performing the review will be Gene Hsii, Tanya Ford, Jay Li and Michelle Hart. They'll be discussing different topics in the Chapter 15 review. These items, the summary of changes, are listed on the next several pages. The bolded items we'll discuss in detail, we'll go through those. I'm not going to go through and read them.

We'll go directly to the presentations. Gene Hsii.

MR. HSII: The first item I want to talk about is the power regime uncertainty. The certified

AP1000 DCD Revision 15, the design analysis assumed 2 percent uncertainty. The use of 2 percent power uncertainty is conservative throughout that section there.

All Chapter 15 design pieces continue to use 2 percent, with the exception of large break LOCA. And the best estimate of large break LOCA analysis assume 1 percent.

The DCD does not provide an instrumentation methodology used to determine this 1 percent, so we have RAI to Westinghouse. And in response to the RAI, Westinghouse proposed to make it a COL item. So the COL holder calculated the parametric uncertainty after they selected the instrumentation and basically confirmed that the calculated value is listed in the numbers assumed in analysis, that's 1 percent. So they should do it before first load. And we think this is acceptable.

CONSULTANT WALLIS: I don't quite understand why it matters, when they have now got 300 and something degrees by using ASTRUM. Does 1 percent make any difference?

MR. HSII: No.

CONSULTANT WALLIS: Unless they want to get closer later on by upping the power level. One

percent makes no difference to the PCT that is significant.

MR. HSII: It makes some different, but not significant degree.

MEMBER ABDEL-KHALIK: Do we have a rough order of magnitude of how much difference a PCT, does that change respond to?

MR. CUMMINS: I don't know. Do we have any large break people still here? Jill, do you know? I think it's a few degrees. I mean it's nothing, nothing compared to 300 degrees. So it looks inconsistent, but we were trying not to change more things than we had to change. So Dan, can you say how much 1 percent power would affect --

MR. GOLDEN: I would put it in the 10 to 20 degree range.

MR. HSII: So as of now, uses 1 percent uncertainty verification is a COL item, but in the last session Westinghouse mentioned that they might change that to ITAAAC something. We have not received this submittal yet, so we are not reviewing it.

MR. CUMMINS: Yes, well I think we are submitting something to change it to an ITAAC.

MR. HSII: So the next one is the ADS valve operating time change. I think we already talk

about that a while ago. Basically, they change the -- to get ADS-1 and ADS-4 activation time will be larger. ADS-1 was actuated by CMD low one signal, and ADS-4 is by low two signal. And the delay time was changed from 20 seconds to 30 seconds for ADS-1 and from 30 seconds to two seconds for ADS-4. And also the valve stroke time is also changed too. As a result of this change, we at the RAI asked Westinghouse to evaluate the impact of Chapter 15 event. And since the primary purpose of ADS was for a small break LOCA analysis. So they evaluate several small break LOCA events, like two-inch quarter break, DBI line break. The results show not much difference except the ADS, the RWST injections start earlier, because ADS-4 activation was changed from 30 seconds to two seconds. So we can see the difference in the IRWST injection times earlier because the RCS exposure is earlier too, so that's why.

MEMBER ABDEL-KHALIK: Has the staff done any independent calculation to verify this third bullet?

MR. HSII: No, we did not do any independent calculation. Because the -- we did not do that.

MEMBER ABDEL-KHALIK: And the basis for

that decision is what?

MR. HSII: Well, the code is already approved for large break LOCA analysis. They used the same code, so we did not spend time calculate --

MEMBER ABDEL-KHALIK: How do you account for SB LOCA? The third bullet.

MR. HSII: The small break LOCA, yes, it's not -- do the analysis.

MEMBER BANERJEE: I think his question is, have you validated the effect is minimal based on --

MR. HSII: The small break LOCA code?

MEMBER BANERJEE: Or you just accepted it?

MR. CUMMINS: This is Ed Cummins. Just to understand what we did. I can't comment on what the staff did. So what we did was we tried to time these out so we would have the same ADS pressure versus time, and so in each line you have to open two valves, so we opened the first one earlier and the second one later, and so if we didn't do it we still could adjust it even. I mean we were trying to adjust it to get the same ADS profile, and I think we did a good job and we can still play with it a little bit. The real problem is, the valve opening, times in the

valves, is a little longer, so sometimes you start them early, and that's what we're doing.

MEMBER ABDEL-KHALIK: Well, I'm just trying to verify if the staff has done any independent calculations to verify the correctness of what you claim.

MR. HSII: No, we did not do that.

MEMBER BANERJEE: Do you have the tools to do it?

MR. HSII: We have -- when we do AP1000 small break LOCA in design certification, we have that code to do it. We did that at that time, we did the verification.

MEMBER BANERJEE: So you have the decks for the small break LOCA. But you didn't think you needed to verify it?

MR. HSII: Well, because we were asked not do the impact analysis, the evaluation and we found out the impact is small, so we didn't bother because the margin to accept the criteria is so large.

CONSULTANT WALLIS: It might, because I did calibrate the abilities of a trace to use it from time to time just to see how it correlates with vendor codes.

MR. DONOGHUE: This is Joe Donoghue,

branch chief again. Indeed, for future work that we expect to get with the AP1000 we are getting trace step developed. But for this review the judgment was made that we thought that the margin was large enough that the impact wasn't going to be a challenge to that margin so we elected not to expend resources basically trying to get that TRACE developed.

CONSULTANT WALLIS: But you are ready to use it when you need it? You are ready to use TRACE at a more appropriate time?

MR. DONOGHUE: We expect to be ready to use TRACE when we need it for example for future amendments.

MEMBER BANERJEE: Is TRACE, is it to handle these situations, if you have to get an amendment which includes the power of something, you could do it?

MR. DONOGHUE: I expect that we'll be able to do that. Research is still finalizing that work for us.

MEMBER BANERJEE: We haven't seen a TRACE applicability report.

MR. DONOGHUE: Right, that's exactly what I'm saying, we haven't seen research complete all that work for us.

MEMBER BANERJEE: Okay.

MR. HSII: The next topic is the change in source range flux doubling setpoint boron dilution block. The source range flux doubling function is used for protection against boron dilution event during the shutdown operation. If the source range flux increase and exceed the setpoint because upon dilution, you trip the -- you initiate the isolation of make-up valve to isolate the water from the demineralized water storage tank. In the existing version of the Chapter 15.4 dilution event that assumes 1.6 in 50 minutes and in Revision 17 we changed to 3.0 over 50 minutes.

The safety analysis in 1.4 dilution event demonstrates that this is critical. So this is acceptable. Maybe Tanya will talk about 15.4.

MS. FORD: Hi, my name is Tanya Ford, and I'll be discussing the DCD Section 15.4.6, boron dilution events.

The current design realigns the make-up pump suction from the demineralized water tank to the boric acid tank to restore shutdown margins. The proposed change would close the make-up line and demineralized water tank installation valves or trip the make-up pumps to terminate the boron dilution

event as soon as possible.

And long-term recovery for this event will then be accomplished in either a different flow path or a smaller unpurged volume by using make-up line after purging most of the un-borated water.

And Westinghouse along with this design change has proposed several text and logic changes to support this modification. These changes are also consistent with DCD Section 9.3.6, which is the CVCS Chemical Volume and Control System, and would mitigate the boron dilution event even sooner.

Therefore the staff finds that this change is acceptable, and there are no significant impacts to the transient analysis currently in the design.

MEMBER ABDEL-KHALIK: Now the analysis assumes that the rods are in manual; is that correct? Or are the rods in auto?

MR. CUMMINS: This is Ed Cummins. I don't know. I think all the rods are in the breakers.

(Simultaneous speaking)

MS. FORD: The next change is what Gene was just mentioning let's not change the source range doubling setpoint from a multiplier of 1.6 to 3.0 over 50 minutes. And this change is basically discussed in Chapter 15. It's provided in Table 15.0-4A, and DCD

Section 15.4.6 the change is actually just removing this value from the text, and they are making the statement that a sufficiently large increase defined -- I'm sorry, it's making the statement that upon detecting a sufficiently large flux increase.

So the change in this section is just to remove the specific value, but the value that defines sufficiently large is this 3.0, which is identified in the table. Next slide.

MEMBER BROWN: Is the table referenced, or is it just -- somebody has to know that?

MS. FORD: In the --

MEMBER BROWN: Kind of an editorial question. It's just a number hanging out there.

MS. FORD: Right. I believe in the RAI response that is where it is tied to that table. I am not specifically sure if the text and the DCD specifically points what sufficiently large is defined as, to Table 15.0-4.

MR. CUMMINS: This is Ed Cummins. We're trying to make this a setpoint that we can -- with a basis. That's why they don't --

MEMBER ARMIJO: You want flexibility?

MR. CUMMINS: Yes.

MEMBER ARMIJO: Okay.

MEMBER BROWN: I don't have any problem with that. It's just that if it's going to be called out in a table I would have just expected you'd change the table if you want to change it some time. I was just curious, that's all.

MS. FORD: And the final change in 15.4.6 is Westinghouse proposes to change dilution flow rate, the RCS water volume, critical shutdown, boron concentrations, and automatic protective actions initiation times for modes three, four and five. The RCS water volumes were recalculated using the latest geometric data available, accounting for design changes made up to this point. And these changes are consistent with the tech spec, the DCD Section 9.3.6, and the assumed conditions for the inadvertent boron dilution event. And the staff finds these changes acceptable.

MEMBER STETKAR: I think the rest of the presentation is on large-break LOCA; is that correct?

MS. FORD: Yes.

MEMBER STETKAR: Let me see if I can get a couple of things in quickly here before we end the day. One of the items that changed in the DCD between Rev 15 and Rev 17 was that Westinghouse deleted a statement regarding the need to consider a failed

operator actions as an active failure. And the SER discusses that item, and the only place in the safety analysis where Westinghouse takes credit for operator actions is to isolate broken sample line. And you conclude that while because there are more than 30 minutes available, therefore the analysis is acceptable, and you can take full credit for that operator action.

I guess a question to the staff is, is that consistent with the guidance that you are using for new reactor licensing in other areas such as control room designs, and the licensing of digital instrumentation control systems where the guidance says, we should now no longer accept a fixed time window of 30 minutes or 20 minutes or any minutes that a licensee should justify that the time available to perform the action versus the amount of time that is required to detect and actually perform the action was some margin was acceptable.

MR. HSII: Our position is if you take credit of operator action to identify how long you have the time to identify the issue. You got to also have operator training to really detect the event, and then you got to go through the exercise to find out --

MEMBER STETKAR: Well, except in the SER

-- I hear you saying that here in the meeting, but in the SER it says that you concluded that the assumed operator action delay time of 30 minutes is acceptable because it is consistent with the current operating plant design basis analysis of a break in a small line outside containment. So there is no discussion that you looked at any justification for the amount of time available, or the amount of time that is required. You simply said, well, because we accept it for currently operating reactors, we are going to accept it for AP1000. And I thought we as an agency aren't doing that anymore.

MR. HSII: Well, this evaluation was performed during the design certification. The conclusion of this statement is stated in the SER in NUREG-1793 for AP1000.

MEMBER STETKAR: Except that Westinghouse for some reason removed -- I'm not familiar, I wasn't here during previous times, so you are saying that they took credit for that 30-minute operator action before, in other words, they didn't penalize themselves for an active failure in the previous --

MR. HSII: They took credit of that and we approved it in previous meetings.

MEMBER STETKAR: Okay, I understand,

thanks.

CHAIR RAY: Well, but still, John, the provision, if it was being satisfied previously, is being removed here, and then the question was asked, well, wouldn't you rely on operator action? The answer was to isolate this sample line is the only place that we take credit for operator action.

But it seems to me like removing the statement is more profound than simply asking and answering that question.

MEMBER STETKAR: Well, it's my understanding from what they said, though, that in the certified design, Westinghouse did not consider that as a failure. In other words Westinghouse did not assume that the operator never isolated that line. So that -- and the design was certified to those conditions. Is that right?

MR. HSII: That's right.

MEMBER STETKAR: So I might feel uncomfortable with it today, but if there is no actual change from the previously certified design.

MR. HSII: No, there is no change.

MEMBER STETKAR: The other question that I had is that this again is deletion of a statement, and I'd like to understand how that affects the

previously certified design. So the following statement has been deleted from Rev 17. Conservative passive RHR heat exchange or heat transfer coefficients low associated with a low flow rate caused by reactor coolant pump trip are assumed. And that is removed. And in the SER it says, in addition the applicant deleted conservative PRHR heat exchange or heat transfer coefficient to provide more accurate information consistent with the existing analysis of the event.

Does that mean that the heat transfer coefficients in the certified design were not conservative, although the DCD said they were?

MR. HSII: I think Westinghouse already discussed that. The reason they made these changes was because -- the statement there is not consistent with their analysis. That's why they remove it.

MEMBER STETKAR: I understand that the analysis probably used best estimate heat transfer coefficients. On the other hand the DCD stated that they were conservative.

MR. HSII: Because they say that statement is not consistent with their actual analysis. So they just deleted it to make it consistent.

MEMBER STETKAR: Okay, have you thought about whether the heat transfer coefficients that they used are appropriately conservative. I mean you accepted the old analysis and did some verification that indeed they bound the heat transfer under those conditions?

MR. HSII: We did not go back -- as far as the analysis it didn't approve in design certification and so we -- we only review the change.

MEMBER STETKAR: Okay, but my question is, that I can sit here and write something and say, this is conservative and put it in writing. And you can read that. If you don't independently go back and verify that the numbers that were used are conservative or optimistic or best estimate and simply accept my statement that it's conservative and base your conclusion on that statement, that's one thing. And if I now remove that statement, saying oh well, I want to change my statement, they weren't really conservative; they were really best estimate. Have you gone back and really examined --

MR. HSII: No, we did not do that. Because they did not do a new analysis.

MEMBER STETKAR: I understand that.

MR. HSII: So we did not review the

analysis; that was already reviewed and approved in full. So now what they are saying is, they go through the documentation change, verification and final statement why it's not consistent with the actual analysis, so they delete. Right now this statement is not correct, so they delete it. That is my understanding.

MR. McDONALD: This is Allen McDonald from Westinghouse transient analysis. The heat transfer coefficients we used in the PRHR were approved in WCAP. We used the approved correlation for those heat transfer coefficients are not necessarily biased conservative or, you know, based on the analysis. We don't bias them one way or another. That is addressed in other PRHR related heat transfer parameters.

MEMBER STETKAR: Did the staff review that WTAP and accept it?

MR. McDONALD: Yes.

MEMBER STETKAR: Okay. Thanks.

MR. HSII: And this evaluation was done previously.

MEMBER STETKAR: Okay, thanks.

CHAIR RAY: Okay, well, I'm going to -- be careful of that microphone -- I'm going to go back

and revisit this question. We often find ourselves, and I'll get to my second question, a case where this applies evidently, and say, well, you can't do this or you can't do that because it's part of the Rev 15 and there is nothing being changed.

Now in the case of the paragraph that John brought up, it seems like a simple straightforward revision in the existing design certification. It says: a single incorrect or omitted operator action in response to an initiating event is also considered as an active failure. The error is limited to manipulation of safety-related equipment. It does not include thought process errors that could potentially lead to common cause or multiple errors.

Now that is a generic statement. It's part of the Rev. 15 certified design, correct?

MR. HSII: That's right.

CHAIR RAY: So they want to take it out. And so you ask the question, well, where do you take credit for operator action, and the answer was as John described. Only one place, and that's at the small line break. Well, even if you are totally satisfied with that answer which depends on the proposition that a break in the sample line will be detected and isolated within 30 minutes, even if you buy that idea

and evidently that is also part of the certified design, it's not clear to me why then you think well, then, it's okay to take it out.

MR. HSII: Well, our reason is because removing that statement does not affect their Chapter 15 analysis.

CHAIR RAY: For the licensing basis it's a statement that the certification was made based on. Why can't it -- why shouldn't it remain there? Why take it out? Because it may be that you will in fact rely on it at some point in the future where you say well, you defined a single action failure this way, and now your design was certified on that basis. I find it troubling to go through this what to me is a very cramped logic to remove what is a sensible provision that was part of the certified design. I don't see why --

MEMBER STETKAR: Except, Harold, it wasn't part of the certified design, because if they had applied that statement literally the certified design could not have taken credit for the operator manually isolating that line, because that would have been the single act of failure. There's not any automatic isolation.

So the certified design did not comply

with the logic of that statement.

CHAIR RAY: Well, I guess I thought, John --

MEMBER STETKAR: They had to take the statement out to make the verbiage consistent with the analysis that was done.

CHAIR RAY: I guess I thought that the 30 minutes was intended to -- for whatever length of time as you said -- was intended as a compensation for the active failure to identify and isolate the line.

MEMBER STETKAR: Single active failures have no time limit on it, whether it's electrical or mechanical or misplaced operator. In design licensing space.

CHAIR RAY: Well, all right, but it doesn't change my concern that it's a significant provision in the certified design that is being taken out. And I guess if the evaluation had said they can't live with this and it's got to be removed for that reason, and it's an unnecessary requirement and so it's okay to take it out, I'd feel better than the discussion that is here now.

MR. HSII: Because we find out that all the events analyzed did not take credit for operator action except for that.

CHAIR RAY: Well, you didn't find that out, you asked them and they said that was the answer you got, but it doesn't necessarily mean that there won't be some other provision identified later. To me it's simply a significant global provision that if, as you say John, they can't live with it, well, okay, I guess there should be an exception for the sample line. It's still a good idea to consider an active failure to be an incorrect or omitted operator action. That is my opinion.

MEMBER BROWN: Well, that's an interesting point. Because if you -- I'm relating back to the instrumentation stuff -- if you go look, we're doing Reg Guide 1.62 right now, which is manual operations for protective actions, and for diverse backups, et cetera, et cetera. I think we're going to be doing this for the full committee; we had a subcommittee. And if you go look at IEEE 6034-1991 it talks about you can have protective actions that rely solely on operator actions as long as you meet some other conditions. You have displays that are available. The environment is not going to turn him into a piece of toast in the interval in which he has to do something. It does not address the time available or time required. That's an issue that we

will be discussing. And you have to meet independence and single failure for the actions that you take. But it never says anything about that single failure of the operator. If the operator is the single failure point, what do you do about that? It seems to apply across the board for manually initiated operator actions.

So if you look and they say they take credit for it, forget about what the time is, it's allowed, but nobody ever says once you depend on it, you have to say there are two operators, one guy may die but the other guy can go take the action within 30 minutes. It's somewhat of a dichotomy.

CHAIR RAY: Well, in this case they are taking credit for this operator action, and they are not considering a single active failure to be a failure that would isolate the broken line.

MEMBER BROWN: But what is the alternative? If the operator, if he's the primary mode of protection for that issue?

CHAIR RAY: There may not be any alternative in this case. I'm just saying, this was a good requirement. It's part of the licensing basis or the certified design basis as we sit here today, and it's being taken out.

MEMBER BROWN: But if he does not act, do they fail something?

CHAIR RAY: If he does not act?

MEMBER BROWN: If he does not take the action within whatever the time period is that is allowable, then you are supposed to go do something else, you are supposed to do something automatically if that happens. That's my understanding from reading all the rest of the requirements, that you can only take operator action if you can do these things within the time available, time required, and you have displays, et cetera, but we never throw that in. So this is almost a circumstance where you can't comply. If he doesn't take action and you have a failure, what do you do?

CHAIR RAY: Are you arguing the case for taking this out?

MEMBER BROWN: Yes, because you can't do anything about it unless you want to go the next step and install some automatic mode of protection which meets all the other rules.

CHAIR RAY: I'm not sure I agree with that. I mean I think for example if you are going to have a line break outside containment, a guy doesn't recognize that there is a line break and doesn't

isolate it, then there would be a radiation alarm or something that would come in at some point that would be a backup.

But we are spending too much time on this. Really. Because I think you are saying they should take it out --

MEMBER BROWN: I'm saying I understand -- I'm coming up with a reason why. Nobody gave a reason. I'm trying to look back at the way we do the rest of the stuff and say how we would have applied this logic. I'm not saying it's right, I'm just saying I would have applied -- they gave me no answer, I'm giving you an answer. Whether we agree that it's a good answer or not, we can go discuss that in a gentlemanly manner.

CHAIR RAY: All right. I still don't like taking it out. Yes.

MR. HSII: Because if you don't take it out, then we would consider that as a single failure, and then the assumption we will say, you have to assume there were single failures in the analysis. Then they cannot take operator action to isolate the valve.

CHAIR RAY: The assumption here is that the guy taking the sample says, oh, there isn't any

water coming out of here any more. I must have a line break and I'll go isolate it. That's what it says.

MR. HSII: Well, because they have a lot of indications for the operator to realize there is a line break there, so they isolate it.

CHAIR RAY: I know, but I'm saying, it seems like a good design criteria.

I don't want to argue about this anymore. I just think that you are taking something out of the existing certified design that was a good provision, and there may be cases where you need to have some exemption, I don't know. But it says right here that they will notice that there is a break in the line because there isn't any sample flow anymore. Besides that it releases radioactivity and you are going to get area radiation monitor alarms and so on. Okay.

Now does that mean that the criteria can't be met because only one guy can respond and isolate this thing? No, and the provision as it's worded I think is a good requirement. So that's my two cents worth on that.

Now the other question here is on the -- there is a long legal argument here in 15.2.4.8.2 about Standard Review Plan Section15.4.8, having to do with the fact that we are beyond six months after this

provision comes out and so on. I just had one question: what if we weren't six months beyond? What would have had to have happened here that isn't being considered? Because you already have to consider the reactivity effects of a rod ejection accident. What else would have happened?

MR. HSII: If the design certification was not --

CHAIR RAY: Not exempted. And it had to meet 15.4.8, what would have been the consequence of that?

MR. HSII: Okay, the analysis for the rod injection uses form kinetics. There is a lot of margin there. In the SER they already discussed they have, if they use -- I think the existing acceptance criteria is 280 calories per gram. The SER indicates that, if they use 3-D calculations for this event, they will probably meet it, okay. First you have to answer a little bit more about it. Is it 4.2 --

CHAIR RAY: -- I'm just trying to find out a simple answer to the question.

MS. McKENNA: I think a simple answer is as Gene was saying is that our judgment is that if they did the 3-D model they would meet the kind of newer criteria, if that was a requirement on them that

they'd have to do the analysis to show what the criteria was met and that's what would be different, if it was within that six month kind of requirement.

CHAIR RAY: Okay, I also heard him say he thought they would meet it.

MS. McKENNA: Yes, but they haven't done the analysis, a judgment based on the margin in the calculation that was done.

CHAIR RAY: Okay, because I couldn't tell in this long convoluted legal analysis of backfitting rule and so on what on earth was not being done that would have otherwise had to be done. Just an analysis, 3-D analysis, okay.

Okay, it's quarter to 5:00, we better get on. You're spinning the large break issue.

MR. HSII: With large break LOCA analysis, in the certified DCD Revision 15 there is the so-called CCQD method, best estimate, not corporate analysis. In Revision17 they changed the metric to ASTRUM. Next slide , talk about the comparison between CQD and ASTRUM method. First, CQD and ASTRUM method use the same computer code, use WCOBRA/TRAC for a global thermohydraulic calculation and use HOTSPOT for the local hot rod calculation.

CONSULTANT WALLIS: They use the same

code, and what's in the code is the same. There is no change whatsoever? There is no change in the use of an equation, that is changed because it is now used in a different way? Is it exactly the same?

MR. HSII: Exactly the same code except for the different version of the code.

CONSULTANT WALLIS: Well, what does that mean?

MR. HSII: I talk about that later, we talk about the applicability of that. The different version is because in Revision 15 they used 2000 formulation of the WCOBRA/TRAC. Since then there are a lot of code changes, you know. For every code change it's required by 10 CFR 50.46 is a conforming requirement, a code change or version, evaluation, model change, that exceed 50 degrees, you've got to report it within 30 days. If it is higher than 50 degrees you've got to enter it in your report. So since then, since 2000 formulation there are a total of 35 changes. Okay? And so the code itself is the same WCOBRA/TRAC except for this modification.

(Simultaneous speaking.)

CONSULTANT WALLIS: The modifications make no difference; is that correct?

MR. HSII: Well, we talk about the code

modifications.

CONSULTANT WALLIS: Because it's been modified. It's not really the same code, is it?

MR. HSII: Well, no.

CONSULTANT WALLIS: So the argument that they used the same code really isn't solid?

MR. HSII: Well, from a big picture, they used, for instance, in CQD that now CQD method, in Revision 15, there is 2000 formulations of WCOBRA/TRAC. In ASTRUM method -- when NRC review ASTRUM method and approve it in 2004, the rate of some change from using in 2000 formulation and 2004, those have been reviewed, okay. Now we are using a newer version of WCOBRA/TRAC and that has no change since 2004 CQD -- I mean 2004 ASTRUM method approved. And so we reviewed the change, too. We see how much impact it is on this change. So basically the fundamental codes --

CONSULTANT WALLIS: The impact depends on how it is used, and it might be that in order to use a statistical method that you had to use a slightly different formulation in order to make it a best estimate value which could then have uncertainties about it in order to fit the ASTRUM method in a way which was not used before the CQD, I don't know. But

is there any specific changes made in order to make it suitable for use with ASTRUM? Because of the way in which ASTRUM operates?

MR. FREPOLI: This is Cesare Frepoli of Westinghouse. As part of submitting the ASTRUM to the NRC, we made an attempt -- we actually have an Appendix B that became 16009 which includes what we call a revalidation of the code, a partial revalidation of the code. That was reviewed by the staff. The intent of that validation was kind of to clear the history of all the code changes that we accumulated over the years up to Rev 6, and that was presented, so we selected some significant changes, we didn't do a formal revalidation, but the significant one has been repeated to show that the code was performing essentially the same. So it's not identical mathematically but it is essentially the same. And that was the newest part of the ASTRUM methodology and approved by the staff.

CONSULTANT WALLIS: That was some time ago, right?

MR. FREPOLI: This, we got the ACR in 2004.

CONSULTANT WALLIS: And there were no specific changes made for AP1000 for this meeting?

MR. FREPOLI: There were no specific change made for the AP1000.

MR. HSII: And since 2004 they got more change too. We got the reporting requirement, all the changes there. And since 2004 there is another 16 changes.

CONSULTANT WALLIS: So what you put into ASTRUM has to be a best estimate code, so what you have to make sure it seems to me is that you are not using some old conservatism or some old treatment of the physics which is not suitable for best estimate use. That's the only thing that might concern somebody. So the code is constructed so it's strictly a best estimate code now.

MR. FREPOLI: It is what we referred to before as better estimate because we have some --

CONSULTANT WALLIS: It doesn't have the old conservatisms and things in it?

MR. FREPOLI: No, it doesn't.

CONSULTANT WALLIS: This is why you gained some 100 and some degrees.

MR. FREPOLI: Right.

CHAIR RAY: Okay.

MR. HSII: So basically CQD method and ASTRUM method used the same thermohydraulic code. The

other difference in the CSAU method -- they might use the same CSA methodology, both methods, and in CSAU methodology there are some three steps. The first two steps are related to the code application assessment kind of stuff. Element three is the treatment of uncertainty. So the only difference between CQD and the ASTRUM method is element three, how you treat uncertainties. And in the CQD they use response-service method, and in ASTRUM method they use all the statistics -- parametric, all the statistics. That is the only different. And both CQD and ASTRUM method has been approved by NRC.

CONSULTANT WALLIS: I think one of Sanjoy's concerns was approved by NRC for what? Has it been approved for use with AP1000?

MR. HSII: The ASTRUM method has been approved every BWR. And this is the first time we have -- they tried to use it for AP1000. So when they approve ASTRUM in 2004 it did not specifically say --

CONSULTANT WALLIS: Let me ask you if I may, when you approve something like ASTRUM for a new use, it's sort of established in use, right? It's a method which makes sense. But if you approve it for a new use, what do you look for, just to check to see that it's still okay? What sort of things do you look

for?

MR. HSII: We know that the code is applicable to AP1000 WCOBRA/TRAC or HOTSPOT.

CONSULTANT WALLIS: But the range of parameters --

MR. HSII: That's right. So when you look at the code, see if the code is applicable for AP1000.

CONSULTANT WALLIS: You answered one of the questions. Does it apply to the range of parameters in the AP1000?

MR. HSII: Yes, and as far as the difference between the ASTRUM and CQD method is in the statistics part. And our argument is the treatment of uncertainty, statistic method, is independent of the physical system. So the method applicable for the AP1000, from the point of view of statistic.

MEMBER BANERJEE: So let me ask you a question. When they did this analysis previously, they used the same code, the same way, and they did sort of a linear analysis with an uncertainty. Was the uncertainty the penalty they put on for interactions between parameters, was that 200 or 300 degrees Fahrenheit? Because in a way that's exactly what determined. It was 200, 2,150 before. Now it's

200 degrees or more below. And this is just the penalty for the interaction in the nonlinearities between parameters? It seems a bit extreme.

CONSULTANT WALLIS: Is it because the response surface is more of an envelope of everything, and the statistic thing looks at everything underneath.

MEMBER BANERJEE: It seems like sleight of hand. I am very suspicious of this whole thing. How is it possible that --

CONSULTANT WALLIS: Maybe the response surface shows, instead of it being 95/95 is 99.9999, maybe it's way out on the tail of everything.

MEMBER BANERJEE: I find it hard to buy, really. I mean physically I just don't see where you gain this much of a nonlinear interaction.

MR. HSII: I think this question --

MEMBER BANERJEE: Have you sort of validated this in some way?

MR. HSII: No, we look at the method, it's approved.

MR. FREPOLI: It's approved, so what? There is some mystery in applying ASTRUM in operating plant. So we did like -- I don't know, many, more than a decade for sure. What we found is that there

was -- in some cases we had like analysis that we did in the past back in the late 90s on the, with the CQD, and we had to re-perform with the ASTRUM. And it was quite consistent that we could gain some margin in PCT, particularly, and it varies from design to design. But it could be 100, 200, sometimes even 300 degrees.

MEMBER BANERJEE: So this is just part of the penalty that you have?

MR. FREPOLI: It's hard to have like an apple-to-apple comparison, but sometimes you have like if you have a small uprate you can judge it, it is very similar, so where the difference is coming from. The thing in there with the response surface was that the superposition stat was an additional eight cases which we were running without the COBRA/TRAC. Then you were performing a regression from those eight cases, and look at the variability around the regression. So you really have a very small database, and then we are asked to bound that linear effect. And for some plants, that stack could drive an additional 300 or 400 degrees on the top of what's coming out from the linear staff, we could Monte Carlo something out of the response surface. So it's not surprising that with ASTRUM by eliminating the stuff,

there is some gain there.

MEMBER BANERJEE: But the penalty is off the error of 200, that's what you're saying?

MR. FREPOLI: Yes, we have many plants that were similar enough to see that similar behavior as far as the gain that's computed through ASTRUM.

CHAIR RAY: Well, maybe I don't understand tails, but to me it's not surprising at all if you chop the tail off a 95/95 distribution you are going to get a big --

CONSULTANT WALLIS: Sometimes those tails go out a long way.

CHAIR RAY: You're darn right. You're the expert and I'm the layman.

MEMBER BANERJEE: No, I'm not an expert at statistics. I like deterministic stuff.

CONSULTANT WALLIS: The interesting question is why should it be 95/95, and not 99/99.

CHAIR RAY: I know, I circled that, but I'm not qualified to ask the question.

CONSULTANT WALLIS: ASTRUM at least it has the virtue that you understand what's going on.

CHAIR RAY: I do?

MEMBER BANERJEE: You do.

CHAIR RAY: I have my own explanation,

and it's that we chopped off the tail.

MEMBER BANERJEE: It makes sense.

CHAIR RAY: But when you walked in, Graham, you were asking a question. Are you done?

CONSULTANT WALLIS: I was just waiting for Sanjoy.

MEMBER BANERJEE: If I associate different calculations, I can have very different tails, right?

CHAIR RAY: Yes, I mean your point --

MEMBER BANERJEE: The sensitivity of the tail is very important.

MEMBER STETKAR: With the Monte Carlo analysis you test for --

CONSULTANT WALLIS: But the speed of regulatory decisions, you go with 95/95, we know that chops off the tail. Until they change the regulatory decision, I guess we live with that. So that's the way it is.

CHAIR RAY: That's the way I would think about it, but again I'm not qualified.

MEMBER SHACK: Well, let's put it this way. Let's do 95/95 for a large break LOCA; for as small break LOCA which has a much higher chance of happening, you might well want to make it some other

number. But this into the 95/95 is the fact that large break LOCAs just don't happen all that often.

CONSULTANT WALLIS: So if AP1000 -

(Simultaneous speaking)

CONSULTANT WALLIS: -- small break LOCA was the key thing, do you want to change the way you do that? If it's the large break LOCA that matters.

MEMBER SHACK: I don't have a best estimate small break LOCA yet. And when they bring a small break LOCA in we will have that discussion. At the moment they probably are at the 99/99 because they are using bounding analysis on the small break LOCA.

CONSULTANT WALLIS: Do the large breaks cover a range of sizes?

MEMBER SHACK: Well, one foot is still a --

CONSULTANT WALLIS: A foot.

(Simultaneous speaking)

CHAIR RAY: Okay, it's 5:00 o'clock. Let me try and press on. But before we do, because people here may leave before we get absolutely done done, who are planning to come back tomorrow, let me say that the NRC has put out a notice to employees that the National Weather Service has posted a winter storm warning for this area due to snow expected tonight

through tomorrow morning.

So in consultation with the full committee chairmen here, we decided that we will start at 10:00 and end at 5:30 tomorrow. Instead of 8:30 we'll start at 10:00. The reason is that this admonishes employees of the NRC to take notice of the warning and drive slowly to work, or don't come to work, or whatnot.

(Comments off the record)

CHAIR RAY: And so because of that bring a sack lunch and we will have a shortened lunch break as well.

But anyway in all seriousness it seems like a reasonable thing to do, given what little we know, that those of you like Member Brown here who have to drive across the Potomac River to get here be given a little more time, or perhaps he will need to take the Metro in that circumstance.

(Comments off the record)

CHAIR RAY: All right, let's push on. This is not the last agenda topic we have today, and so we've got to keep moving.

MR. HSII: Okay, so the next slide is what's really new? In support of this large break LOCA analysis in DCD Revision 17, it's now submitted a

technical report. The application of ASTRUM is about best estimate large break LOCA analysis. And that technical report provides a detailed description of the analysis and a lot of relevant information. So we used that technical report as our basis to do a review. Our review was performed with technical assistance from ISL, Mr. Ed Throm, who is here today. He helped us perform a detailed review.

Basically what we reviewed is, we reviewed the applicability of WCOBRA/TRAC and HOTSPOT for AP1000, as I mentioned awhile okay, the WCOBRA/TRAC and HOTSPOT was already approved, CQD was Revision 15. We reviewed the changes since then, since 2000, the version of 2000 that was used in Revision 15.

Now all the changes since then we look at it. The next review we did is the WCOBRA/TRAC nodalization model for AP1000 analysis. And look at the ASTRUM applicability to AP1000 large break LOCA, the application of ASTRUM to AP1000 large break LOCA, and the result.

MEMBER BANERJEE: Did you do anybody staff validation or verification or confirmatory analysis? Didn't do any confirmatory analysis at all?

MR. HSII: No, because the code has been reviewed before, and we only look at the changes to

the code. And in the validation -- Westinghouse did a validation using the CGTF and UPTF, again to validate the code. We look at code. We didn't do an independent validation.

MEMBER BANERJEE: Did you have a code you could use for independent checks?

MR. HSII: We have the RELAP5 model code and TRACE code I think is available now.

MR. DONOGHUE: That is still under development and research. But again we were in a position where we were looking at a DCD revision, and we looked at the changes and made a judgment that wasn't necessary to do the confirmatory analysis for these changes. Because the nature of the changes and the margin that they have.

CONSULTANT KRESS: ASTRUM has to sample from a probability distribution parameters. Did you -- how do you go about deciding whether that probability distribution is the right one?

MR. HSII: We follow the same methods approved in ASTRUM method. The uncertainty position is described in that technical report, and I think Mr. Throm look at it and compare that with the ASTRUM method, see if they are consistent. The distribution, you look at those.

MR. THROM: My name is Ed Throm. Basically the distributions were identical to those previously approved except for one which was noted in one of the change notifications, as a result of an error in the analysis of a test there is a blowdown heat up uncertainty that goes into HOTSPOT. That had to be modified on its distribution because of the error in the test. So that distribution was modified; it's a different distribution.

The point with any of the changes that got made to either WCOBRA/TRAC or HOTSPOT would be independent of whether you were using CQD or ASTRUM. You are making sure that the thermal hydraulic codes are being corrected when errors are found.

Again the ASTRUM methodology is just a way of -- let's you deal with the results from the codes, from the statistical approach.

So when we say that they are the same codes, they are essentially the same, but as things progress you find errors, and you need to fix them, so there are some small changes between the code that would have been approved for Version 15 and the one we are now looking at on Version 17. But regardless those changes would have had to have been made, and they also affect operating plants as well.

Otherwise the distribution is right then according to what was approved when basically WCOBRA/TRAC was approved for use in the statistical approach.

CHAIR RAY: Okay, proceed please.

MR. HSII: So we reviewed the applicability of WCOBRA/TRAC and HOTSPOT for AP1000, and as I mentioned awhile ago, we look at the changes since 2004, 2000, but since WCOBRA/TRAC was reviewed in 2004 when we approved the ASTRUM. So we only look at the recent -- the change since 2004. And there are a total of 16 changes since 2004. A majority of those changes are so-called discretionary change. It does not impact on it. So there are only four changes that are applicable in nondiscretionary change.

CONSULTANT WALLIS: By discretionary you mean it doesn't change something like a heat transfer correlation? It changes some minor thing?

MR. HSII: Minor some change, but the impact is small. Westinghouse already look into that and find out those changes have minimal impact.

MR. THROM: When you look at the changes, some of the changes that got reported for example were we changed with one of the applet file which, you know, we changed the code, and it had no impact

whatsoever. Whenever a change is addressed under 50.46, they tell you where it is and they do an assessment to determine whether or not it would have impacted either the validation base or current licensing analysis. For the most part except for the two changes that required the one to modify the blowdown heat transfer distribution multiplier, and the one for the HOTSPOT fuel relocation, of course they have an impact on the results.

The other two changes that were made to the code were discretionary, and they were just a different way of defining how you would calculate or predict when the end of blowdown occurred, because it's a point you need to go into the HOTSPOT analysis. But again all the changes that get done are across the board for the PWR fleet. We elected to four of them are related to the AP1000, basically the two that would be different in the code from Version 15 to Version 17 are the heat transfer correlation and the flex to the fuel relocation.

MR. HSII: So we look at those four nondiscretionary changes, and Ed, do you want to continue about these four discretionary changes?

MR. THROM: Well, no, two of the changes were discretionary as I pointed out. They used to

define the end of blowdown as when the pressure got to 40 psi, and then they decided to redefine it as when the pressure is no longer decreasing. And then the last change was made in 2006 when they said, well we are going to define the end of blowdown as the time when the collapsed level in the lower plenum reaches its minimum value, and you are basically starting into a refill situation. So they are just numbers that are in the automated process of taking the data from WCOBRA/TRAC and transferring it into the HOTSPOT calculation.

The other two nondiscretionary changes again were the heat transfer correlation and the HOTSPOT fuel relocation error. Otherwise the rest of them were basically things like input-output files where they only addressed certain operating plants, or in one case it was -- we forgot to upgrade and tell you we were actually using Incanel data in the code. So most of them are really benign from the perspective of what gets done. Most of them are discretionary, and assist Westinghouse in either automating or processing, transferring information, or in the way that the data goes into or is taken out of the code.

CHAIR RAY: Okay.

MR. HSII: Another thing we look at is

the WCOBRA/TRAC validation using the CCTF and UPTF data. You look at the AP1000 master LOCA PIRT. One of the unique AP1000 features is the injection, and given for AP600 and AP1000, before they use the CGTF and UPTF data to verify AP1000 and the same process is in here again for the revised version. And the result is almost identical. There was not much change.

And we also reviewed the WCOBRA/TRAC nodalization.

MEMBER BANERJEE: But going back to the comparison with AP600, AP600 had a lower energy density in the core, right, than AP1000. So it's consistent with the AP600 validation. What did you have specifically for the AP1000 in terms of validation? Was there material that was -- tests or whatever?

MR. HSII: Ed, can you answer on that?

MR. THROM: The specific validation we are talking about here is with the current version of the code, the codes that exist today. We asked Westinghouse to reconfirm that the way the code is still treating the DVI line hasn't changed. What was done in the AP600 the cylindrical core test and the upper plenum test facility were used to evaluate the DVI, and basically to evaluate the end of bypass

conservatism that is more or less inherent in the code.

But because their workload changes, we requested Westinghouse review those validations of those two tests to make sure that nothing happened in the code that was unexpected in terms of the performance of the DVI plant.

MEMBER BANERJEE: Were there any integral effect, integral tests done for AP600, validations?

MR. THROM: I can't remember; that's quite some time ago.

MEMBER BANERJEE: Was ROSA --

MR. THROM: Yes, I believe the NRC had something --

MEMBER BANERJEE: So what was the energy density in ROSA?

MR. THROM: I can't answer that.

MR. FREPOLI: Cesare Frepoli, Westinghouse. Just go back to the approach that we'll be taking with the 600 and 1000. Large break is the same, or very similar, to regular BWR. So our integral effect test facility provided it in the code as being LOFT for BWR, and so that's how --

MEMBER BANERJEE: Were there any lab break tests done on LOCA or on ROSA?

MR. FREPOLI: We didn't look at those. And again the premises were --

MEMBER BANERJEE: But you are injecting in a different place, right? You're not injecting in the cold leg?

MR. FREPOLI: No, and in fact to look at the effect of the DVI the test selected was the full scale or live scale test facility like UPTF and CCTF. And again the assumption there is that conditionally AP1000 and BWR are very similar from a large break LOCA standpoint.

MEMBER BANERJEE: I think qualitatively what you are saying is right, but there are a lot of detailed differences, like in LOFT for example there was a lot of bypass if I remember. So if you look at the details of these things, they are different. So I'm wondering, were there any integral tests? My impression was that there were some comparisons at least with RELAP. I remember this with ROSA. But was there any integral test comparisons with that COBRA/TRAC?

MR. FREPOLI: This goes back to the work that we did the AP1000 design certification, would look at the PIRT, we identified it was close enough, and so LOFT was still applicable, and that's how the

design got certified.

MEMBER BANERJEE: Based on LOFT?

MR. FREPOLI: Essentially based on LOFT, yes.

MEMBER BANERJEE: With rewetting thermocouples.

MR. CUMMINS: This is Ed Cummins. I believe that, on large break LOCAs, we all agreed a couple of times, AP600 and AP1000, that the large break was really out of the accumulator for the vessel. And it's not an integral effect. It only is the accumulator and the vessel. So how do you model the break and how do you model the accumulator. And that is the same as we do with our current operating plants, and although the phenomena are the same and we didn't have any PIRTs that were AP1000-specific, and we didn't have any models that were AP1000-specific, so all of our tests concentrated on small breaks where we had lots of differences for make-up tanks and PRHR heat exchangers and IRWSTs.

MEMBER BANERJEE: But you are not injecting into the -- I mean you are not injecting at the same spot. Your breakers --

MR. FREPOLI: That was identified in PIRT by looking at --

MEMBER BANERJEE: It was not important?

MR. FREPOLI: You know, the CCS bypass and impact on DVI rather than cold-leg injection. And that has been addressed with UPTF that provided tasks. There is a special test with the DVI injections. Those were the bases -- those were in addition to regular PWR that is used for an AP1000 and AP600, and the staff required us to redo this when we worked with the new version with the code. We showed that the results were the same.

MEMBER BANERJEE: So this is basically relying on Version 15, whatever was there is the same, whatever we had proved at that point?

MR. FREPOLI: That is correct.

MR. HSII: So we also review the WCOBRA/TRAC nodalization model. The WCOBRA/TRAC nodalization model is essentially the same as the model previously used in Revision 15 except for the inclusion of some design changes. The nodalization include the verification model. This model is essentially the same as previous one except for the change in pressurizer dimension. And the activation model is also the same except for the internal change that was the radial support key, the flow skirt and neutron panel attached to the outside of the core

barrel. So we look at those nodalization model. In addition we also look at the -- there was a limitation when we review the AP600, the nodalization. The SER, AP600 SER imposed a limitation that says, if the -- during the blowdown exceed 1725 degree Fahrenheit, the applicant is to evaluate the sensitivity of CMT and passive RHR, and that they will ensure the sensitivity to be small.

Next one is the applicability of ASTRUM to AP1000 large-break LOCA analysis. The ASTRUM method has been approved for the current operating PWRs, and we think the uncertainty-treatment methodology is implemented independent of physical systems being modeled, so we think it is applicable to AP1000.

CHAIR RAY: Okay, and that of course is a central question that we discussed earlier. We need to be mindful of the fact that it is now 5:30.

One of the things that I think may be useful, Weidong, is if we can get the report, I presume a consultant report, that staff is basing these statements that they are now making on, that may quickly get us to where we need to go.

MR. WANG: Are you talking about the technical report?

CHAIR RAY: No, I'm not talking about the

Westinghouse technical report. I assume the staff has gotten some report from their own consultant?

MR. HSII: The next one that you said, the application of the ASTRUM method to AP1000, the ASTRUM large break LOCA analysis is used to calculate three parameters: PCT, maximum local oxidation and the core-wide oxidation. By this non-parametric method in ASTRUM -- it requires 124 runs. So that's what it does; it runs 124 cases of WCOBRA/TRAC and HOTSPOT. So for each run this uncertainty contributors is randomly sampled, and input into WCOBRA/TRAC. And the result of that WCOBRA/TRAC is get input to HOTSPOT through LOCA model calculations.

MEMBER STETKAR: Does that -- I hate to ask this, and perhaps that information is available in the report that Harold just asked for -- the selection of 124 runs must be based on some type of Monte Carlo convergence process. Is that correct?

MR. HSII: It's the same method they used in ASTRUM method for the operating plan. It's described in WCAP-16009. It's formally submitted. There is nothing special for AP1000.

MEMBER STETKAR: Okay, thank you.

MEMBER ARMIJO: I have a question that is for the staff, and maybe for Westinghouse. If you had

applied the ASTRUM methodology to the DCD Rev 15 as is with no changes in the designs, how much would the peak clad temperature have been reduced? To me that is a central thing. If it was reduced to a similar extent, it's all the same thing.

MR. CUMMINS: Essentially the same answer.

MEMBER ARMIJO: Same answer? Okay. It is largely design changes.

MR. CUMMINS: Didn't have any affect on it really.

MEMBER ARMIJO: We're just talking about the use of ASTRUM to something that hasn't changed very much. So I understand it now. Thank you.

MR. HSII: In the uncertainty used in ASTRUM is essentially the same as was used in CQD method in Revision 15 except for the parametrics and uncertainty is the 2 percent, they changed to 1 percent.

For the uncertainties of the initial conditions, boundary conditions, and furthermore there was input into WCOBRA/TRAC analysis, and also include the -- which type, which area, critical flow model, in WCOBRA/TRAC.

In doing the analysis, there is some

parameter that is set to a bounding value, and it was determined by the sensitivity study. For instance, they determined how many percent of steam tube clogging. Whether the loss of off-site power is more conservative or the off-site power is available is conservative. It's all going through the sensitivity study to determine what would be the bounding case. We also checked the range of parameters compared with tech spec LCO; that's what we did, too.

CONSULTANT KRESS: When you choose a conservative bounding value for some parameter, what does that mean? Do you have a distribution, you choose the 95 percent level?

MR. HSII: Only the major ones. For instance, they did a sensitivity study to determine whether off-site power is available -- or not available, and to determine what outside power is available is not limiting. So that would be the assumption.

CONSULTANT KRESS: I can understand that.

MR. HSII: And then determine what is the limiting single variable, use that as extension, so you don't have to do it for the staff.

CONSULTANT WALLIS: So these are really yes-no questions rather than bounding values.

CONSULTANT KRESS: That's what confused me.

MR. HSII: So the reserves show that the PCT is 18-37 degrees less than permitted 200-degree criteria, and here is a typo here. It says LCO; it's local -- so isn't that supposed to be M-L-O, maximal local oxidation, it's 2.25 percent. It's 17 percent of acceptance criteria. And core-wide oxidation is .2 percent, less than 1 percent.

Coolable geometry, long-term cooling are not affected by ASTRUM method. So the conclusion is that the ASTRUM analysis show that large break LOCA complies with 10 CFR 50.46 criteria.

MS. CLARK: So therefore staff concludes that the AP1000 DCD Revision 17 provides reasonable assurance that we provide adequate protection for the design basis events, meeting the acceptance criteria specified in GDC 10 CFR 50.46.

MEMBER ABDEL-KHALIK: I have a question about the 1 percent uncertainty. Well presumably the COL applicant will have to demonstrate that their power balance measurements can conform to that requirement. By the same token we have to do the calibration between the power range instrumentation and the energy balance measurements on a daily basis,

and there is an expected drift of .4 percent. At least that's what you estimate, and you will tell us some time in the future where that number comes from.

Now why don't the analyses also include the drift? In addition to the 1 percent uncertainty in the energy balance measurements?

MR. CUMMINS: Ed Cummins. I'm going to tell you what I think; I'm not sure on this. I think that if you treat this the same way the current plants treat their ultrasonic flow measurements, they -- I'm not sure if they check their ultrasonic against their normal venturi flow, then it's periodically once a month, not once a day for sure. And I believe some of this drift is drift in the setpoint, and what you are getting is a setpoint study, and they are very conservative, and they say well, all that 8 percent is going to be -- if I want to trip at 120 percent power, then I have to subtract 8 percent from it to make sure I trip by 120. It's not really a measurement of power.

MEMBER ABDEL-KHALIK: I understand that. But if we are recalibrating the nuclear instrumentation on a daily basis, because we expect that there will be a difference between what the nuclear instrumentation indicates and what the energy

balance, the real measurement, presumably, of what the output of the reactor is, we are not controlling this plant using the energy balance measurements. We are controlling it using nuclear instrumentation.

MR. CUMMINS: Yes.

MEMBER ABDEL-KHALIK: So why aren't we allowing for the fact that 23 hours and 59 minutes before this -- or after the energy balance is done we expect these two measurements to differ by X percent which could very well be more than the 1 percent that the licensee will demonstrate as far as the capability of their energy balance measurements.

MR. CUMMINS: So I think that really the errors are not related to that table. And what you find is that what you determine with ultrasonic measurement is the I'll say fouling of the venturi causes it to read let's say 1.2 percent lower, and you decide that. And whenever you do your daily measurements, you can add your -- you can't do this forever, but whenever, you can add your 1.2 percent low bias back in, and you can calibrate your nuclear instruments based on the fact that you know that the venturi plus 1.2 percent measures valid flow.

(Simultaneous speaking)

MR. CUMMINS: Periodically you have to

prove that that 1.2 is still true, or maybe it's 1.3 or 1.1.

MEMBER ABDEL-KHALIK: Couldn't it go the other way around?

MR. CUMMINS: It could, but I don't think it usually does. I think -- Bill Brown, are you still here? Okay, he did a lot of study on this ultrasonic, so he could have helped us. But I think that people are finding that plants are getting uprates by 1 percent because they can show that the fouling of their venturis can be biased by these accurate flow meters on a periodic basis.

MEMBER ABDEL-KHALIK: Well, I'm concerned about the case where the nuclear instrumentation would drift low, rather than drift high. I think that's why you have to calibrate it every day. You have to bring the calibration of the nuclear instrument back to the heat balance everyday.

MR. CUMMINS: It could drift low or high, I believe.

MEMBER ABDEL-KHALIK: Right. So the question is, why are we only accounting for the uncertainty in the energy balance measurements, rather than also accounting for the possibility that these instruments might drift low?

MR. CUMMINS: So it should be that the energy balance error is close to drift, the maximum daily drift or something?

MEMBER ABDEL-KHALIK: Correct.

MR. CUMMINS: I don't know. That's beyond me.

CHAIR RAY: Think about it overnight.

MR. CUMMINS: I think the maximum daily drift is very little. I hope it's not much.

MEMBER ABDEL-KHALIK: We don't know what it is. The question is equally applicable to the stack.

MR. DONOGHUE: This is Joe Donoghue. I think that the 2 percent that is in the regulations, and I'm reaching back to a very hazy recollection of what I think is contained in transcripts of hearings for the Appendix K and 50.46 rulemaking, discusses the basis which is -- includes drift studies for instrumentation. And those numbers that we are talking about, I think Mr. Cummins has it right, there's instrumentation drift, and there's analyses that assume I think conservative, but this is Chapter 7 INC review for purpose of this 1 percent based on the low measurement, energy balance. It's -- there's different contributors. And I think the answer to

your question is that 50.46 and the Appendix K to 50.46 were written, those things were considered. What I can't tell you is exactly how. I just don't remember. I could go do research, but I believe the answer is that they were accounted for. But to answer the question about does the point four relate to the 1 percent, I don't think so, but we have to get Chapter 7 people and INC people to explain that.

MEMBER ABDEL-KHALIK: Regardless of what the argument is, the concern is, what is the real reactor power at the time an event occurs.

MR. DONOGHUE: Right.

MEMBER ABDEL-KHALIK: And if the real reactor power is different than what the indicated power because of uncertainty in the energy balance measurements, and because of this daily drift between nuclear instrumentation and the energy balance measurements, then by gosh, drift should be taken into account.

MR. DONOGHUE: And until relatively recently we've said you have to do an analysis that assumes your power is 2 percent higher than what your license is, so they've done that. And be sure to account for all these contributors, and when they started doing these measurement uncertainty uprates

based on some kind of -- well, ultrasonic is one method, there could be others, I don't know. We have come to the conclusion they could reduce that 2 percent not down to zero -- I don't think there are any cases where we have approved that they got rid of all the uncertainty -- but for purposes of this, I think it showed that there is a better, more dependable -- let's put it that way -- way of measuring the calorimetric. They could account for that uncertainty and go from 2 percent down to something lower. Here they are saying it's going to be down to 1 percent, and they have to demonstrate that. That's what you heard earlier about a COL item.

CHAIR RAY: Okay, wait a minute, this is way too late to be going through -- we understand all of that. We are just going to make an action item that says this proceeding that we are considering here right now seeks to establish 1 percent, and in connection with that we want to know how the drift of the instrument is treated in the context of a 1 percent assumption of reactor power, 34-34, whatever the aggregate is. How is instrument drift considered in that? And that response should reflect what you are talking about, but from somebody who can tell us chapter and verse. We didn't consider instrument

drift, or we did, or something.

MEMBER ARMIJO: That is not an AP1000-unique issue, that's generic.

CHAIR RAY: I understand, but we have an AP1000 thing right in front of us here. I'm not asking Westinghouse, I'm asking the staff, because the staff has the access to how this is thought about by the agency.

MEMBER SHACK: Well, it might be more important when the licensee comes back in with his 1 percent analysis, has he considered all these variables and lumped them in? I mean that's what Joe is saying. We pretend as though that is a flow measurement of uncertainty, but it really represents everything, and as long as you can see that their procedure includes all that, if they choose to lump it in some way --

CHAIR RAY: I'm not sure that it does include everything, Bill. And that's what I want.

MR. CUMMINS: One of the 2 percent uncertainty is from flow measurement, and the other one percent is for some other things.

CHAIR RAY: That's what I want to sort out, and I want to start with the staff and find out, so we have the right person to look at this in the

context of the AP1000.

My god, are we to the last page yet? Not yet, let's keep trying.

MS. HART: I'm Michelle Hart. I'm here to talk about something completely different.

CHAIR RAY: You've been here so long.

MS. HART: This is the design basis dose analysis. They're still in Chapter 15, but it's a slightly different area.

To get the good news out of the way we have completed all of the review on the off-site dose consequences, so we found that revision 17 is acceptable with respect to that.

We could not make a finding on the control room compatibility at this time though, because there is an open item, because there is a design change to control room emergency ventilation system.

This is open item 15.3-1. Westinghouse would propose the addition of a passive control room air filtration line, to the bottled air system, the emergency habitability system. And it's intended to allow them to do meaningful testing of the control room envelope unfiltered in-leakage.

The staff is currently reviewing the proposed design change, and when that review is

complete we will finish looking at the dose analysis that reflects that design.

They said earlier today that it should be done this month. We have heard that it may be coming into us for review beginning of March, that's the last we heard.

We've done a preliminary audit of a previous version of the calculation. It looks acceptable, but it is based on we'll have to predicate it on the other branch determining that the system design itself is acceptable.

CHAIR RAY: Well, is this the first application of such a thing?

MS. HART: This is a brand new application. Nobody else has tried to do this.

MR. CUMMINS: So Ed Cummins, I think that this will fit perfectly in our Chapter 6 review. I mean we don't really need to -- when we talk about the design of this thing, you'll understand it and find it comfortable. Then we'll assess the doses and the results of it. It's part of Chapter 6. It's like changes have tentacles, we are just looking at a tentacle here.

CHAIR RAY: Okay, we'll accept that logic.

Item nine on our agenda is going to have to be deferred until tomorrow. Rob, I assume you will be here, and you can talk about it then.

MR. SISK: We have him standing by or we can do it tomorrow morning.

CHAIR RAY: Yes, it'll be closer to noon, but based on the availability of the individual. Sorry about that. I haven't done a very good job today, I tried, God knows.

(Laughter)

But without much success. Anyway, we'll see you at 10:00 o'clock, or if the government shuts down tomorrow, I don't know what to tell you.

MEMBER BROWN: A weather update for you. My wife just told me that we are expecting six inches tonight, which means this place will be blanketed.

MR. CUMMINS: So just -

(Simultaneous speaking)

MR. CUMMINS: We got them to open the door for us.

CHAIR RAY: Well, I can't do anything.

MEMBER BROWN: That is just a prediction. Hey, it could be 12.

COURT REPORTER: Are we still on the record?

(Laughter)

CHAIR RAY: Let me pound the gavel and we'll adjourn for today.

(Whereupon at 5:47 p.m. the proceeding in the above-entitled matter was adjourned)

# AP1000 Reference Combined License Application Presentation to ACRS Chapter 3 Standard Topics

February 2, 2010

# R-COLA Chapter 3: Standard Topics

**Design of Structures, Components, Equipment and Systems**

**3.1 Conformance with NRC GDCs**

**3.2 Classification of Structures, Components and Systems**

**3.3 Wind and Tornado Loadings**

**3.4 Water Level (Flood) Design**

**3.5 Missile Protection**

**3.6 Protection Against the Dynamic Effects of Piping Rupture**

**3.7 Seismic Design**

**3.8 Design of Category I Structures**

**3.9 Mechanical Systems and Components (Snubbers & IST)**

**3.10 Seismic and Dynamic Qualification**

**3.11 Environmental Qualification**

# R-COLA Chapter 3: Standard Topics

- DCD incorporated by reference
  - No Standard Departures taken
- Majority of FSAR Chapter 3 information is IBR of DCD
- Standard supplemental information
  - Dual unit turbine missile consideration
  - Snubber testing program
  - Inservice test program for valves
  - Addressing COL items (next slide)

# R-COLA Chapter 3: COL Items

COL 3.6-1 Pipe Break Hazards Analysis

- still working as DCD and COL OIs
- likely a standard post-license requirement for design reports and as-built confirmations

COL 3.6-4 Primary System Inspection Program for Leak-Before-Break Piping

- confirmed materials and programs as identified by DCD

COL 3.11-1 Equipment Qualification File

- provided standard program description
- still working as DCD OI

# R-COLA Chapter 3: COL Items

COL 3.9-2 Design Specifications and Reports

- post-license update of as-built information

COL 3.9-3 Snubber Operability Testing

- provided standard list of snubbers and testing criteria

COL 3.9-4 Valve Inservice Testing

- provided standard program description
- still working as DCD and COL OIs

COL 3.9-5 Surge Line Thermal Monitoring

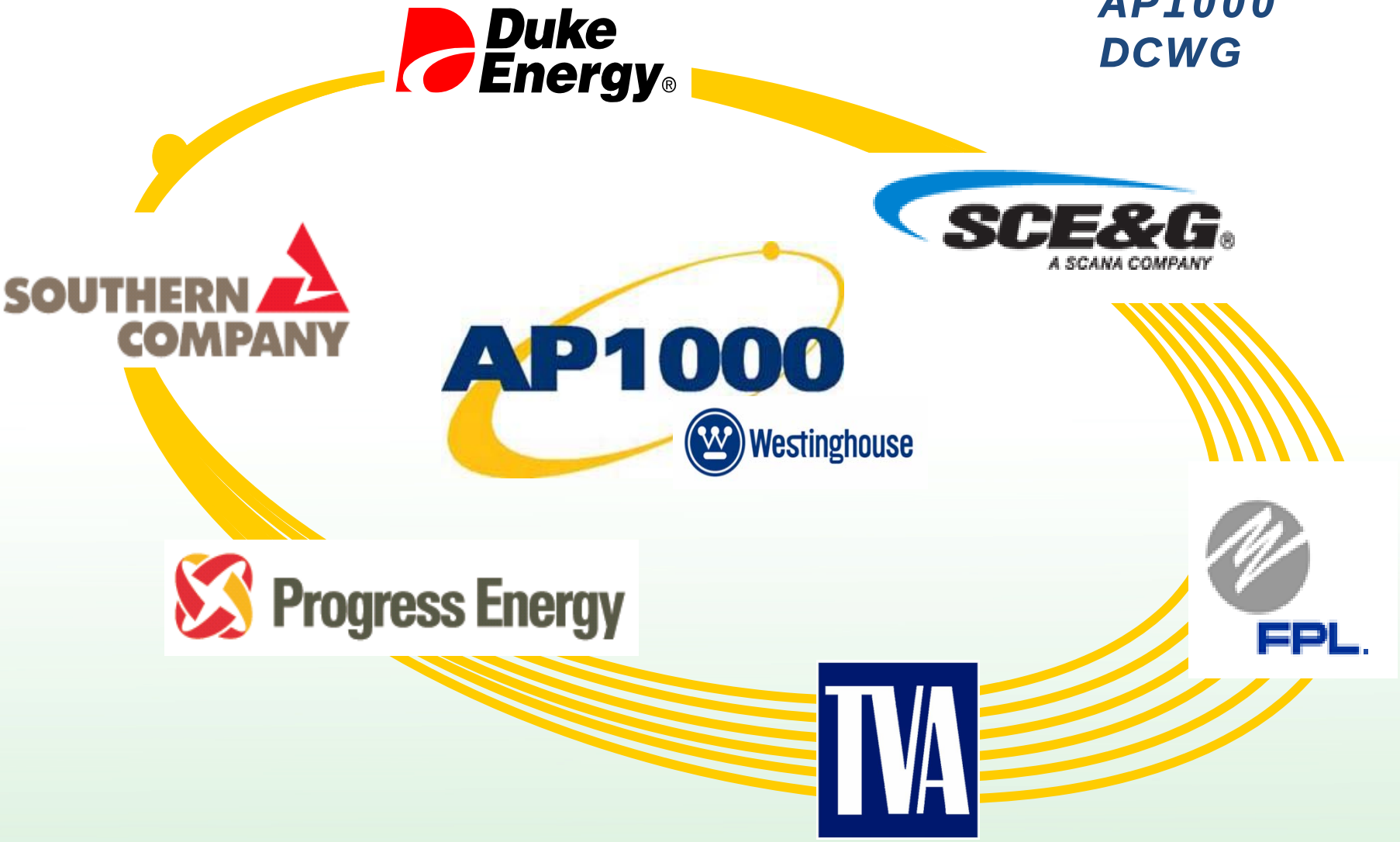
- provided standard program description

# R-COLA Chapter 3: Open Items

- OI 3.6-1 Pipe Rupture Analysis (STD COL 3.6-1)
- OI 3.10-1 Seismic Qualification Method and Schedule
- OI 3.11-1 Environmental Qualification (DCD OI closure)

# R-COLA Chapter 3: Open Items

- OI 3.9-1 Inservice Testing Program (DCD OI closure)
- OI 3.9-2 IST MOV vs POV clarification
- OI 3.9-3 IST MOV testing during operation
- OI 3.9-4 IST Potential periodic dynamic testing of POVs
- OI 3.9-5 IST Flow induced vibration concerns
- OI 3.9-6 IST Tech Spec references


Duke Energy
SCE&G
A SCANA COMPANY
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AP1000
Westinghouse
Progress Energy
FPL.
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# Presentation to the ACRS Subcommittee

## AP1000 Combined License Application Review Standard Content for

## SER/OI Chapter 3
## Design of Structures, Components, Equipment and Systems

February 2, 2010

# Staff Review Team

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- **Project Manager**
  - **Terri Spicher**, Chapter 3, AP1000 Standard Content COL

# Overview of AP1000 Standard Content COL Chapter 3 - Design of Structures, Components, Equipment and Systems

| Summary of Content | | Standard Content Open Items (total) |
|---|---|---|
| 3.1 | Conformance with NRC General Design Criteria | 0 |
| 3.2 | Classification of Structures, Components, and Systems<br>3.2.1 Seismic Classification<br>3.2.2 AP1000 Classification Systems | 0 |
| 3.3 | Wind and Tornado Loadings<br>3.3.1 Wind Loadings | **2** |
| 3.4 | Water Level (Flood) Design<br>3.4.1 Flood Protection<br>3.4.2 Analytical and Test Procedures | 0 |
| 3.5 | Missile Protection<br>3.5.1 Missile Protection<br>3.5.2 Protection from Externally Generated Missiles<br>3.5.3 Barrier Design Procedures | **1** |

# Overview of AP1000 Standard Content COL Chapter 3 - Design of Structures, Components, Equipment and Systems

| Summary of Content | | Standard Content Open Items (total) |
|---|---|---|
| 3.6 | Protection against Dynamic Effects Associated with the Postulated Rapture of Piping | **1** |
| 3.7 | Seismic Design | 0 |
| 3.8 | Design Of Category I Structures | 0 |
| 3.9 | Mechanical Systems and Components<br>3.9.1 Special Topics for Mechanical Components<br>3.9.2 Dynamic Testing and Analysis of Systems, Structures and Components<br>3.9.3 ASME Code Class 1,2, and 3 Components, Component Supports, and Core Support Structures<br>3.9.4 Control Rod Drive System<br>3.9.5 Reactor Pressure Vessel Internals<br>3.9.6 Inservice Testing Pumps and Valves<br>3.9.7 Integrated Head Package | **15** |

# Overview of AP1000 Standard Content COL Chapter 3 - Design of Structures, Components, Equipment and Systems

| Summary of Content | | Standard Content Open Items |
|---|---|---|
| 3.10 | Seismic and Dynamic Qualification of Mechanical and Electrical Equipment | 0 |
| 3.11 | Environmental Qualification of Mechanical and Electrical Equipment | 1 |
| 3.12 | Piping Design | 0 |

# Overview of AP1000 Standard Content COL Chapter 3 - Design of Structures, Components, Equipment and Systems

***(blue font indicates open item)***

| FSAR SECTION | | SUMMARY OF DEPARTURES/SUPPLEMENTS |
|---|---|---|
| 3.1 | Conformance with NRC General Design Criteria | none |
| 3.2 | Classification of Structures, Components, and Systems | STD SUP 3.2-1 seismic classification of safety-related SSCs |
| 3.3 | Wind and Tornado Loadings | **STD SUP 3.3-1 the effects of tornado-initiated failures of non safety-related buildings on the neighboring seismic Category I structures** |
| 3.4 | Water Level (Flood) Design | none |
| 3.5 | Missile Protection | **STD SUP 3.5-1 Probability of turbine missiles from another AP1000 plant in close proximity affecting SSCs**<br><br>STD SUP 3.5-2 Turbine system maintenance and inspection program |

# Overview of Standard Content COL Chapter 3 - Design of Structures, Components, Equipment and Systems

***(blue font indicates open item)***

| | | |
|---|---|---|
| 3.6 | Protection against Dynamic Effects Associated with the Postulated Rupture of Piping | **STD COL 3.6-1 A pipe rupture hazard analysis is part of the piping design**<br><br>STD COL 3.6-4 Leak-before-break piping inspections |
| 3.7 | Seismic Design | To be addressed at a later date |
| 3.8 | Design of Category I Structures | To be addressed at a later date |
| 3.9 | Mechanical Systems and Components | STD COL 3.9-2 Reconciliation of the as-built piping<br><br>STD COL 3.9-3 Snubber design and testing, instillation requirements, and perseverance and inservice examination and testing<br><br>STD SUP 3.9-3 Snubber design and testing and snubber installation requirements<br><br>**STD COL 3.9-4 IST Program**<br><br>STD COL 3.9-5 Pressurizer surge line monitoring |

# Overview of Standard Content COL Chapter 3 - Design of Structures, Components, Equipment and Systems

***(blue font indicates open item)***

| | | |
|---|---|---|
| 3.10 | Seismic and Dynamic Qualification | none |
| 3.11 | Environmental Qualification of Mechanical and Electrical Equipment | **STD COL 3.11-1 Equipment Qualification File** |
| 3.12 | Piping Design | none |

# Open Items
# Standard Content AP1000 COL

**STD SUP 3.3-1: the effects of tornado-initiated failures of non safety-related buildings on the neighboring seismic Category I structures**

Two potential effects:

OI 1: Metallic Siding Missiles
OI 2: Water Tank Missiles

# Open Items
# Standard Content AP1000 COL

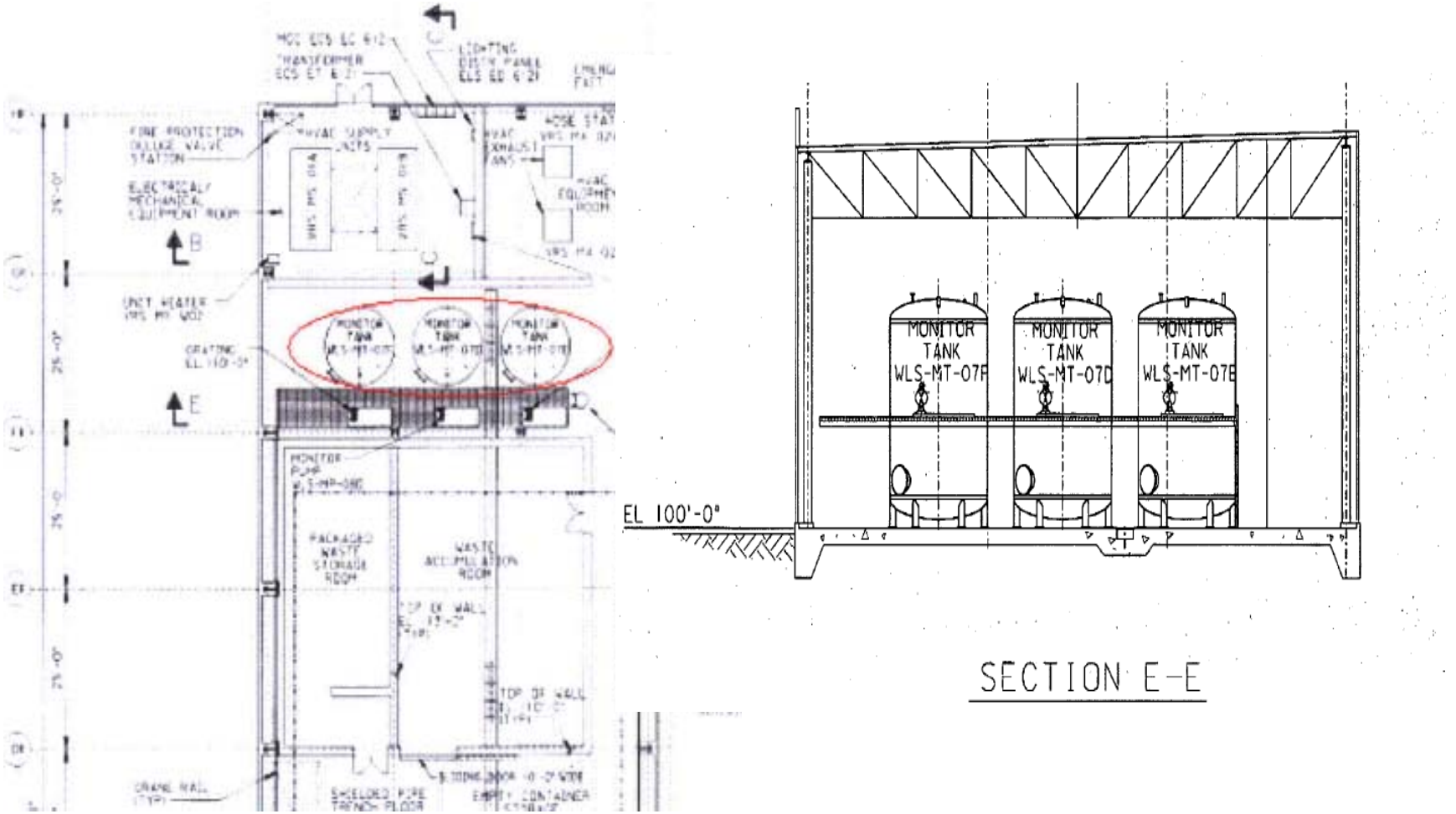
OI 1: Metallic siding of turbine and radwaste buildings need to be evaluated as a potential wind-borne missile against seismic category I structures.

This analysis is pending in the DCD as open item OI-RAI-SRP3.3.2-SEB1-01.

0I 2: Water tanks in radwaste building needs to be evaluated as a potential wind-borne missile against seismic category I structures.

This analysis is pending in the DCD as open item OI-RAI-SRP3.3.2-SEB1-02.

# OI 2: Water Tank Missile



# Open Items
# Standard Content AP1000 COL

## STD SUP 3.5-1: Probability of Turbine Missiles from Co-located AP1000 Plants

0I 1: AP1000 DCD Open Item OI-SRP10.2.3-CIB1-01 was resolved since bounding turbine missile probability analysis is applicable to high and low trajectory missiles for unfavorably orientated TGs for co-located AP1000 units.

# Open Items
# Standard Content AP1000 COL

**STD COL 3.6-1: A pipe rupture hazard analysis is part of the piping design**

OI 1: Action to be addressed by DCD: As-designed pipe rupture hazard analysis report completed. Pending DAC completion.

# Open Items
# Standard Content AP1000 COL

## STD COL 3.9-4: IST Program

**AP1000 SER Section 3.9.6**

01: October 2008 audit follow-up items need to be resolved:

- Reference ASME QME-1-2007 in DCD Section 3.9
- Clarify basis for gate and globe valve seat friction coefficient
- Clarify vendors need to satisfy QME-1-2007
- Resolve RAI response and check valve piping diagram

# Open Items
# Standard Content AP1000 COL

02: Motor-operated valve (MOV) testing needs to be consistent with Joint Owners' Group (JOG) Program on MOV Periodic Verification

03: ASME QME-1-2007 not referenced in DCD Section 3.9

# Open Items
# Standard Content AP1000 COL

04: DCD reference to ASME Code Case OMN-1 should indicate revision accepted in Regulatory Guide (RG) 1.192, or justify alternative to ASME OM Code

05: Tech Specs need to be consistent with ASME OM Code

# Open Items
# Standard Content AP1000 COL

06: DCD should describe check valve acceptance criteria for flow testing consistent with RAI response

07: Note 31 to DCD Table 3.9-16 is not consistent with JOG MOV Program, and Section 3.9 does not discuss power-operated valve program attributes in Regulatory Issue Summary (RIS) 2000-03

# Open Items
# Standard Content AP1000 COL

08: RAI response should be clarified regarding performance of position verification testing specified in ASME OM Code ISTC-3700 in addition to exercise testing

09: Several valve-specific items in DCD Table 3.9-16 need to be clarified

# Open Items
# Standard Content AP1000 COL

**COL SER Section 3.9.6**

01: October 2008 audit follow-up items need to be resolved

02: Motor-Operated Valve (MOV) provisions in COL FSAR need to be clarified

# Open Items
# Standard Content AP1000 COL

03: COL FSAR needs to provide a full description of MOV testing program (such as addressing application of OMN-1 Code Case, determination of MOV operating requirements and output capability, periodic demonstration of design-basis capability, justification for extended test intervals, and successful completion of MOV acceptance criteria)

04: COL FSAR needs to provide a full description of Power-Operated Valve (POV) testing program

# Open Items
# Standard Content AP1000 COL

05: RAI response on implementation of AP1000 DCD provisions to monitor flow-induced vibration (FIV) effects should be clarified

06: Tech Specs in COL application need to be consistent with ASME OM Code

# Open Items
# Standard Content AP1000 COL

## STD COL 3.11-1: Environmental Qualification Program

OI 1: AP1000 SER Section 3.11
Resolve Audit follow-up items per Section 3.9.6

OI 2: COL SER Section 3.11
Resolve Audit follow-up items for transition from initial EQ program to operational EQ program

# AP1000 Reference Combined License Application Presentation to ACRS Chapter 9 Standard Topics

February 2, 2010

# R-COLA Chapter 9: Standard Topics

**Auxiliary Systems**

**9.1 Fuel Storage and Handling**

**9.2 Water Systems (Plant Specific)**

**9.3 Process Auxiliaries**

**9.4 Air-Conditioning, Heating, Cooling, and Ventilation System (Primarily Standard)**

**9.5 Other Auxiliary Systems (Primarily Standard)**

**App 9A Fire Protection Analysis (Primarily Standard)**

# R-COLA Chapter 9: Standard Topics

- **DCD incorporated by reference**
  - The only Standard Departure taken is to section numbering (STD DEP 1.1-1)
- **Majority of FSAR Chapter 9 information related to water systems is Plant Specific**
- **Standard supplemental information**
  - Load handling program
  - Addressing COL items (next slide)

# R-COLA Chapter 9: COL Items

## COL 9.1-5 Inservice Inspection Program of Cranes

- Added light load handling system inspection, FSAR section 9.1.4
- Added heavy loads handling system inspection per NUREG 0612, FSAR section 9.1.5

## COL 9.1-6 Radiation Monitor

- Added requirement for radiation monitors on fuel handling machines, FSAR 9.1.4
- Added requirements for special procedures for heavy load handling

# R-COLA Chapter 9: COL Items

**COL 9.1-7 Metamic Monitoring Program**

- Added description of Metamic monitoring program

**COL 9.3-1 Air Systems (NUREG-0933 Generic Issue 43)**

- Added description of air system procedures and training
- Addressed requirements of GL 88-14 and NUREG-1275

**COL 9.4-1 Ventilation Systems Operations**

- 9.4-1a Described HVAC system testing requirements and inspection per ASME/ANSI AG-1-1997 and Addenda AG-1a-2000 (Reference 201), ASME N509-1989, ASME N510-1989, and Regulatory Guide 1.140
- 9.4-1b (Plant Specific)

# R-COLA Chapter 9: COL Items

## COL 9.5-1 Qualification Requirements for Fire Protection Program

- FSAR section 9.5.1 describes qualifications requirements, training, and administrative procedures and controls governing Fire Protection Program

## COL 9.5-3 Regulatory Conformance

- Described conformance with Fire Protection regulatory requirements including BTP CMEB 9.5-1 (FSAR Table 9.5-201) & RG 1.189

# R-COLA Chapter 9: COL Items

## COL 9.5-4 NFPA Exceptions

- Exception taken to automatic sprinkler protection for intake structure (NFPA 804), FSAR Table 9.5-202

## COL 9.5-6 Verification of Field Installed Fire Barriers

- Testing and inspection added for items that cannot be verified through pre-operational tests (e.g., penetration seals, fire retardant coatings, cable routing, and fire barriers)
- Added periodic testing requirements (e.g., Fire hoses are hydrostatically tested in accordance with NFPA 1962)

# R-COLA Chapter 9: COL Items

**COL 9.5-8 Establishment of Procedures to Minimize Risk for Fire Areas Breached During Maintenance**

- Added requirement for fire protection procedures when a fire are is breached

**COL 9.5-11 Security Communications**

- Described in Security Plan

**COL 9.5-13 Fuel Degradation Protection**

- Added diesel fuel sampling and testing per ASTM D4176 and D975

# R-COLA Chapter 9: Open Items

**OI 9.1-1 Metamic monitoring program**

- Added LC for Metamic monitoring program implementation

**OI 9.1-2 LLHS inspection implementation**

- Added commitment to implement program prior to fuel receipt

**OI 9.1-3 OHLHS program implementation**

- Added commitment to implement program prior to fuel receipt

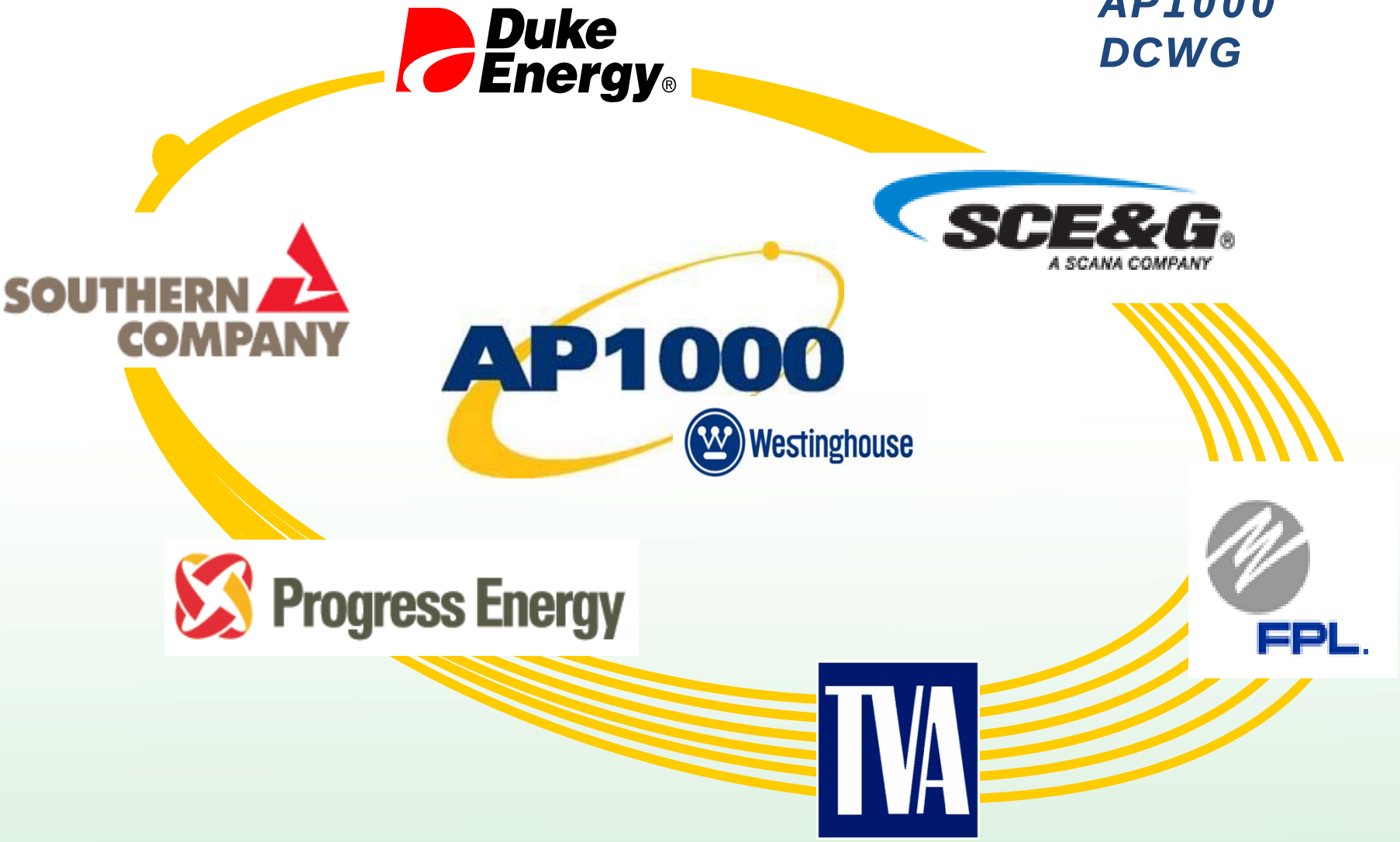
# R-COLA Chapter 9: Open Items

## OI 9.1-4 OHLHS inspection implementation

- Addressed by OI 9.1-3 response and current FSAR commitment on procedure development

## OI 9.2-2 OI 12.03-01 completion

- This OI was tracking closure of OI 12.3-1 (NEI 08-08). Response to OI 12.3-1 has been provided implementing NEI 08-08A


Duke Energy
SCE&G
A SCANA COMPANY
SOUTHERN COMPANY
AP1000
Westinghouse
Progress Energy
FPL.
TVA

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# Presentation to the ACRS Subcommittee

## AP1000 Combined License Application Review Standard Content for Chapter 9 Auxiliary Systems

February 2, 2010

# Staff Review Team

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# Overview of AP1000 Standard Chapter 9 - Auxiliary Systems

| Standard Section | | Summary of Content |
|---|---|---|
| 9.1 | Fuel Storage and Handling | -**Metamic Monitoring Program**<br>-**Light Load Handling System**<br>-**Overhead Heavy Load Handling Systems** |
| 9.2 | Water Systems | -Plant Specific |
| 9.3 | Process Auxiliaries | -Air Systems |
| 9.4 | Air Conditioning, Heating, Cooling, and Ventilation System | -**Inspections and Testing** |
| 9.5 | Other Auxiliary Systems | -**Fire Protection Program**<br>-**Diesel Generator Fuel Oil System** |

# Overview of AP1000 Standard Chapter 9 - Auxiliary Systems

| SRP Section/Application Section | | Open Items |
|---|---|---|
| 9.1 | Fuel Storage and Handling | 4 |
| 9.2 | Water Systems | 0 |
| 9.3 | Process Auxiliaries | 0 |
| 9.4 | Air Conditioning, Heating, Cooling, and Ventilation System | 0 |
| 9.5 | Other Auxiliary Systems | 0 |
| **Totals** | | **4** |

# AP1000 Standard – Section 9.1
# Metamic Monitoring Program

- Metamic – An aluminum-based metal matrix composite containing boron carbide ($B_4C$) to absorb thermal neutrons. Used in AP1000 spent fuel storage racks to provide additional criticality prevention margin.
- Metamic Monitoring Program – STD COL 9.1-7 specifies coupon surveillance program for SFP neutron absorbing material due to limited service experience with material.
  - DCD specified certain aspects of program including type and number of coupons, recommended withdrawal schedule, and attributes to be tested.
  - Test methods, programmatic controls left up to COL applicants.
- Open Item (OI) 9.1-1 because the applicant did not provide sufficient details.
- OI requested additional definition of program elements:
  - Whether the number of coupons and withdrawal schedule will be the same as described in the DCD.
  - The methodology and acceptance criteria for the tests that will be performed on the Metamic coupons.
  - Corrective actions if acceptance criteria are not met.
  - The administrative controls applicable to the program.

# AP1000 Standard – Section 9.1
# Load Handling System

- STD COL 9.1-5 - Inspection & Testing Program

  The Combined License applicant is responsible for a program for in-service inspection (ISI) of the light load handling system (LLHS) as specified in subsection 9.1.4.4 and the overhead heavy load handling system (OHLHS) in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME [American Society of Mechanical Engineers] NOG-1 as specified in subsection 9.1.5.4.

  – Applicant committed to develop a program for in-service inspection of the Heavy and Light Load Handling System
  – Open Items 9.1-2 (ISI-LLHS), 9.1-3 (OHLHS program), and 9.1-4 (ISI-OHLHS) the applicant did not provide defined timeline milestone for development of the program
  – Applicant needed to provide a schedule milestone for developing the plant inspection program for the handling systems (such as “before receipt of fuel.”)
  – The staff has received an open item response from RCOL that is currently under evaluation

- STD COL 9.1-6 – Radiation Monitoring

  The COL applicant/holder will ensure that an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.

  – Applicant stated that plant procedures require that an operating radiation monitor is mounted on any machine when it is handling fuel.

# AP1000 Standard – Section 9.4
# Ventilation System

- STD COL 9.4-1a - The Combined License applicants referencing the AP1000 certified design will implement a program to maintain compliance with ASME AG-1 (Reference 36), ASME N509 (Reference 2), ASME N510 (Reference 3) and Regulatory Guide 1.140 for portions of the nuclear island nonradioactive ventilation system and the containment air filtration system identified in DCD subsection 9.4.1 and 9.4.7.

- The main control room / control support area HVAC subsystem of the nuclear island nonradioactive ventilation system (VBS) and the exhaust subsystem of the containment air filtration system (VFS)) are tested and inspected in accordance with ASME/ANSI AG-1-1997 and Addenda AG-1a-2000, ASME N509-1989, ASME N510-1989, and Regulatory Guide 1.140.

# AP1000 Standard - Section 9.5.1
# Fire Protection Program

- The objectives of the Fire Protection Program are to minimize both the probability of occurrence and the consequences of fires at nuclear power plants.
- The Fire Protection Program uses the concept of defense-in-depth utilizing administrative controls, fire protection systems and features, and redundant safe-shutdown capabilities to:
  - Prevent fires from starting.
  - Rapidly detect and promptly suppress fires that do occur.
  - Provide protection for structures, systems, and components important to safety so that fires that are not promptly extinguished will not prevent the safe shutdown of the plant.

# AP1000 Standard - Section 9.5.1
# Fire Protection Program

**Regulations and Guidance**

- 10 CFR 50.48, Fire Protection
- 10 CFR 50, Appendix A, GDC 3, 5, 19, and 23
- SRP Section 9.5.1, Fire Protection Program
- Regulatory Guide 1.189, Fire Protection for Nuclear Plants
- SECYs 90-016, 93-087, and 94-084: Criteria for enhanced fire protection for new reactors

# AP1000 Standard - Section 9.5.1
# Fire Protection Program

- The staff issued 14 RAIs to address various non-conformances with RG 1.189. The standard content was largely revised to conform with RG 1.189.

- The staff identified that the safe-shutdown analysis methodology included in the standard content Fire Hazards Analysis (FHA) is not in accordance with RG 1.189:
  - An FHA traditionally includes a detailed area-by-area analysis of safe-shutdown equipment and cable routing information. The standard content safe-shutdown analysis is a functional analysis only without the detailed equipment and cable routing information.
  - The applicant asserted that the redundant safe-shutdown trains are separated throughout the plant by 3-hour rated fire barriers by design; therefore, a detailed area-by-area component and cable analysis is not necessary.
  - The applicant also provided that appropriate procedures are in place to readily identify and address any standard design deviations which may occur during the construction phase, and that the FHA will be updated to reflect as-built condition.
  - The staff reviewed the AP1000 plant layout drawings to ensure that separation of safe shutdown trains are maintained by design and conducted two audits of the Westinghouse's fire hazards analysis supplemental report APP-FPS-G1R-002, Rev. 1, which provides for the functional failure analysis for each plant fire area.

# AP1000 Standard - Section 9.5.4
# Diesel Generator Fuel Oil System

- Fuel oil system classified in the DCD as a non-safety system
- In DCD Chapter 17, quality control for non-safety related SSCs is based on supplier procedures and practices
- Operability of the diesels is addressed by investment protection controls
- COL Information Item 9.5-13 addresses:
  - Fuel specifications and properties consistent with manufacturer recommendations
  - Fuel sampling and testing to protect against fuel degradation

# AP1000 Standard - Section 9.5.4
# Diesel Generator Fuel Oil System

- The staff applied acceptance criteria for fuel oil quality from NUREG-0800, Section 9.5.4
- RAI for clarification on implementation of the fuel oil quality program and applicability to both new and stored oil
- Program implementation through the Non-Safety Related SSC Quality Controls in FSAR Chapter 17
- Specification and testing described for new and stored oil in the FSAR under STD COL 9.5-13

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# Presentation to the ACRS Subcommittee

**Westinghouse AP1000 Design Certification Amendment Application Review**

**SER/OI Chapter 15**
**Transient and Accident Analysis**

February 2 - 3, 2010

# Staff Review Team

- **Technical Staff**
  - **Yi-Hsiung (Gene) Hsii,** Reactor Systems, Nuclear Performance & Code Review Branch
  - **Tanya Ford**, Reactor Systems, Nuclear Performance & Code Review Branch
  - **Jay Lee**, Siting and Accident Consequences Branch
  - **Michelle Hart**, Siting and Accident Consequences Branch
- **Project Manager**
  - **Phyllis Clark**, AP1000 DCA

# Purpose

- Brief the subcommittee on the staff's review of the safety analyses and radiological consequence analyses of the Design Basis Events in Chapter 15 for the AP1000 design certification amendment application in DCD Revision 17

- Answer the Subcommittee's questions

# AP1000 DCA Chapter 15 - Transient and Accident Analysis

| DCD Section | Title | Summary of Change |
|---|---|---|
| 15.0 | Accident Analyses | • **Change to Power Measurement Uncertainty**<br>• Change to pressurizer water level setpoints to accommodate pressurizer dimension change<br>• Replace P-8 with P-10 nuclear power permissive Interlock for low-flow reactor trip<br>• Change of CVS isolation valve closure time<br>• **Change to ADS Valve Opening Time Delay**<br>• **Change to Source Range Flux Doubling Setpoint for Boron Dilution Block**<br>• Deletion of Active Failure Consideration Pertaining to Operator Action Error<br>• DCD Documentation changes for clarification and consistency |

# AP1000 DCA Chapter 15 - Transient and Accident Analysis (cont.)

| DCD Section | Title | Summary of Change |
|---|---|---|
| 15.2.6<br>15.2.7<br>15.2.8 | Loss of AC Power to Plant Auxiliaries<br>Loss of Normal Feedwater Flow<br>Feedwater System Pipe Break | • DCD documentation changes for clarification and consistency with safety analyses |
| 15.3.1<br>15.3.2 | Partial Loss of Flow<br>Complete Loss of Flow | Replace P-8 Interlock with P-10 interlock |

# AP1000 DCA Chapter 15 - Transient and Accident Analysis (cont.)

| DCD Section | Title | Summary of Change |
|---|---|---|
| 15.4.1 | Uncontrolled Rod Cluster Control Assembly Bank Withdrawal from a Subcritical or Low-Power Startup Condition | Deletion of manual bypass to the high nuclear flux rate trip after trip reset. |
| 15.4.3 | Rod Cluster Control Assembly (RCCA) Misalignment | DCD documentation changes for clarification and consistency with TS |
| 15.4.6 | Chemical and Volume Control System (CVCS) Malfunction that Result in a Decrease in the Boron Concentration in the Reactor Coolant | • **Modifications associated with mitigation of boron dilution events**<br>• **Source range doubling setpoint for boron dilution**<br>• **Dilution flow rates and RCS water volumes** |
| 15.4.8 | Spectrum of Rod Cluster Control Assembly Ejection Accidents | Removed description of longitudinal and circumferential failures of the RCCA housing units. |

# AP1000 DCA Chapter 15 - Transient and Accident Analysis (cont.)

| DCD Section | Title | Summary of Change |
|---|---|---|
| 15.5.1 | Inadvertent Operation of the Core Makeup Tanks During Power Operation | DCD documentation changes for clarification and consistency with safety analyses |
| 15.5.2 | CVCS Malfunction that Increases Reactor Coolant Inventory | |
| 15.6.1 | Inadvertent Opening of a Pressurizer Safety Valve or Inadvertent Operation of the ADS | • Changed the motor operated valve stroke times for ADS valves Stages 1-3<br>• Changed Table 15.6.1-1 to show the correct trip function modeled in the analysis. |
| 15.6.5.4A | Large-Break LOCA Analysis Methodology and Results | **Best-estimate large-break LOCA analysis using ASTRUM methodology** |

# AP1000 DCA Chapter 15 - Transient and Accident Analysis (cont.)

| DCD Section | Title | Summary of Change |
|---|---|---|
| 15.6.5.4 | Radiological Consequences (LOCA) | Increased duration for credit of aerosol removal in containment |
| 15.7.4.5 | Offsite Doses (Fuel Handling Accident) | Decay time analysis assumption increased to 48 hours to equal proposed TS 3.9.7 value |
| 15A.3.3 | Atmospheric Dispersion Factors | Changes in hypothetical control room $\chi$/Q values to accommodate changes in design and siting assumptions |
| 15 (various) | Each subsection with DBA radiological consequences analyses | Revised offsite dose calculations based on:<br>• changes in DCD sections 15.6.5.4, and 15.7.4.5<br>• one set of offsite $\chi$/Q values for all accidents |
| 15 (var) 6.4.4 | Each subsection with DBA radiological consequences analyses, and control room habitability dose results | Revised control room dose calculations based on:<br>• changes in DCD sections 15.6.5.4, 15.7.4.5, and 15A.3.3<br>• **VES filtration system design change** |

# AP1000 DCA – Chapter 15.0
## Change to Power Measurement Uncertainty

- Design basis event analyses in certified DCD, Rev. 15, assumed 2% power uncertainty for initial thermal power
- DCD Rev. 17 states that the main feedwater flow measurement supports a 1% power uncertainty; use of 2% power uncertainty is conservative
- Except for large-break LOCA, all design basis events continue to assume 2% power uncertainty
- Large break LOCA assumes 1% power uncertainty
- DCD does not specify instrumentation or methodology to support 1% power measurement uncertainty
- Westinghouse proposed COL item 15.0-1:

  Following actual plant instrumentation selection and prior to fuel loads, COL holder will calculate power calorimetric uncertainty using NRC acceptable method and confirm the calculated uncertainty is bounded by the safety analysis assumed value
- Staff finds COL item acceptable, but identifies a confirmatory item to assure COL item is incorporated in next DCD revision

# AP1000 DCA Chapter 15.0
# ADS Valves Opening Time Delay Changes

- Valve actuation delay and opening (stroke) times of various ADS stages are changed
  - ADS-1 actuation delay – on CMT low level
  - ADS-1, 2, and 3 valve opening times
  - ADS-4 squib valve opening time - on low-2 CMT level
- Primary role of ADS is mitigation of small break LOCA
- Westinghouse evaluated the effects of changing ADS actuation delay and valve opening times for SBLOCAs. The results show minimal effects, and the core remains covered
- Non-LOCA events do not model ADS valves, therefore not affected
- Staff finds ADS valve opening time delay changes acceptable, but identifies a confirmatory item to update DCD for identified inconsistencies

# AP1000 DCA Chapter 15.0
## Change to Source Range Flux Doubling Setpoint for Boron Dilution Block

- Source range flux doubling function is used to isolate makeup flow to the RCS for the boron dilution event during shutdown operation
- Existing source range doubling function setpoint of 1.6 over 50 minutes has a significant likelihood of inadvertent actuation of boron dilution protection function
- DCD Rev. 17 change the source range doubling function setpoint to “3.0 over 50 minutes”
- Safety analyses of boron dilution events (DCD 15.4.6) during shutdown modes were re-analyzed with the 3.0 over 50 minutes setpoint. The results show the plant is maintained in subcritical condition
- The staff finds the change to source range flux doubling setpoint acceptable

# AP1000 DCA – Section 15.4.6
# Chemical and Volume Control System Malfunction that Result in a Decrease in the Boron Concentration in the Reactor Coolant

Westinghouse proposed to change the general mitigation method for the boron dilution events to be consistent with CVS design changes for boron dilution in DCD Section 9.3.6.

- The current design realigns the makeup pump suction from the demineralized water tank to the boric acid tank to terminate the potential boron dilution, and to begin to reborate the reactor coolant system to restore shutdown margin.
- The function was changed to close the makeup line isolation valves (as well as the demineralized water isolation valves) or trip the makeup pumps to terminate the event as soon as possible.
- The applicant has also proposed several text changes along with the logic changes that are required to implement this modification.
- The proposed change would terminate the boron dilution event sooner and has no safety-significant effect on the transient and the staff finds it acceptable.

## AP1000 DCA – Section 15.4.6 (cont.)
## Chemical and Volume Control System Malfunction that Result in a Decrease in the Boron Concentration in the Reactor Coolant

Westinghouse proposed to change the source range doubling setpoint from a multiplier of 1.6 to 3.0, over 50 minutes.

- The source range flux doubling function is used to isolate makeup flow to the RCS for the boron dilution event during shutdown operation.
- The proposed change is consistent with AP1000 DCD Table 15.0-4a and the staff finds it acceptable.
- Boron dilution analyses performed for Modes 3, 4, and 5 documented in Rev. 17 of DCD Section 15.4.6 assumed a safety analysis setpoint of 3.0 over 50 minutes; results for all cases are acceptable.

## AP1000 DCA – Section 15.4.6 (cont.)
## Chemical and Volume Control System Malfunction that Result in a Decrease in the Boron Concentration in the Reactor Coolant

Westinghouse proposed changes to the dilution flowrate, RCS water volume, critical and shutdown boron concentrations, and automatic protective actions initiation time for Operating Modes 3, 4 and 5.

- The RCS water volumes were recalculated using the latest geometric data available taking into consideration design changes made up to this point.
- These changes are proposed to be consistent with the TS, DCD Section 9.3.6, and the assumed conditions for the inadvertent boron dilution event and the staff finds them acceptable.

# AP1000 DCA – Section 15.6.5.4A Large-Break LOCA Analysis Methodology and Results

- In Certified DCD Rev. 15, LBLOCA was analyzed with CQD [Code Qualification Document] method (WCAP-12945-A)

- In DCD Rev. 17, LBLOCA is analyzed with ASTRUM [Automated Statistical Treatment of Uncertainty Method] (WCAP-16009-A)

# AP1000 DCA – Section 15.6.5.4A CQD and ASTRUM Methods Comparisons

- Both CQD and ASTRUM methods use the same computer analysis codes
  - WCOBRA/TRAC for global thermal hydraulic calculation
  - HOTSPOT for local hot rod calculation
- Both methods follow CSAU methodology roadmap
- The only difference is Element 3 of CSAU method - sensitivity and uncertainty analysis
  - CQD uses response surface methodology
  - ASTRUM uses direct Monte Carlo sampling, nonparametric ordered statistics
- Both methods have been approved by NRC

# AP1000 DCA – Section 15.6.5.4A Staff Review of AP1000 LBLOCA – ASTRUM Analysis

The staff review focused on the following areas:

- WCOBRA/TRAC and HOTSPOT analysis codes applicability to AP1000
- WCOBRA/TRAC nodalization model for AP1000 LBLOCA analysis
- ASTRUM applicability to AP1000 LBLOCA analysis
- Application of ASTRUM to AP1000 LBLOCA analysis
- AP1000 LBLOCA Analysis Results

# AP1000 DCA – Section 15.6.5.4A WCOBRA/TRAC and HOTSPOT Applicability to AP1000

- WCOBRA/TRAC and HOTSPOT Modifications
  - Reported changes per 10 CFR 50.46 reporting requirement
    - 16 changes after WCAP-16009-A approval
    - 4 changes related to AP1000
- WCOBRA/TRAC validation for unique AP1000 feature - direct vessel injection
  - PIRT: main difference between AP1000 and existing PWRs is the DVI
  - Similar to that done in AP600 validation
    - Cylindrical Core Test Facility
    - Upper Plenum Test Facility
  - Results consistent with AP600 validation (WCAP-14171, Rev 2)

# AP1000 DCA – Section 15.6.5.4A WCOBRA/TRAC Nodalization Model for AP1000 LBLOCA Analysis

- RCS Loop Model includes AP1000 pressurizer design changes
  - Maintain same volume with increased inside diameter and decreased height
  - Revised pressurizer water level setpoints
- Reactor pressure vessel and internals model, includes AP1000 design changes
  - Radial support keys/tapered periphery on lower core support plate
  - Lower reactor vessel head flow skirt
  - Neutron panels attached to core support barrel
- WCOBRA/TRAC modeling limitations from AP600 SER
  - If PCT exceeds 1725$^{o}$F for any reason, sensitivity of CMT and PRHR HX modeling parameters not included in the uncertainty methodology need to be addressed
    - Sensitivity calculation of CMT/PRHR isolation from RCS

# AP1000 DCA – Section 15.6.5.4A ASTRUM Applicability to AP1000 LBLOCA Analysis

- ASTRUM methodology (WCAP-16009-A) has been approved by NRC for best estimate large-break LOCA analyses to demonstrate compliance with 10 CFR 50.46 for operating PWRs

- ASTRUM uncertainty treatment methodology is independent of physical systems being modeled and is equally applicable to AP1000 BE LBLOCA analyses

# AP1000 DCA – Section 15.6.5.4A
# Application of ASTRUM to AP1000 LBLOCA Analysis

- Applied to a random sample of 3 outputs
  - PCT – peak cladding temperature
  - MLO- maximum local oxidation
  - CWO – Core-wide oxidation
- Based on a 95/95 tolerance level
  - Requires 124 WC/T and HOTSPOT runs for 3 outputs
- Uncertainties and biases values unchanged from CQD method
  - Major plant parameter assumptions listed in DCD Table 15.6.5-4
  - 1% uncertainty for initial thermal power
  - Some parameters set to conservative, bounding values based on sensitivity studies
- NSSS and fuel uncertainty contributors sampled for each run
- WC/T global models include break types, break areas, and critical flow modeling
- HOTSPOT local model includes local peaking factor, fuel data, clad reaction rate, burst data, and heat transfer coefficients
- Range of parameters were compared to TS LCOs

# AP1000 DCA – Section 15.6.5.4A
# AP1000 LBLOCA Analysis Results

- PCT = 1837°F < 2200°F
- LCO = 2.25% < 17%
- CWO = 0.2% < 1%
- Coolable geometry not affected
- Long-term cooling not affected
- Compliance with 10 CFR 50.46

# AP1000 DCA – Section 15.6.5.4A Summary

- The staff concludes that the AP1000 DCD, Revision 17 provides reasonable assurance that the AP1000 design provides adequate protection for the design basis events, meeting the relevant acceptance criteria specified in GDCs and 10 CFR 50.46

# DBA Dose Analysis Summary

- The staff concludes that the AP1000 DCD, Revision 17, provides reasonable assurance that the AP1000 design provides adequate mitigation of radiological consequences in an event of a design basis accident to protect public health and safety, meeting the offsite dose acceptance criteria specified in 10 CFR 100.21 and 10 CFR 52.47(a)(2).

- Open Item 15.3-1 regards the review of revised control room dose analysis related to control room emergency habitability system design change.

# Open Item 15.3-1, “Control Room Dose”

- Westinghouse proposed the addition of a new passive control room air filtration line to the main control room emergency habitability system (VES).
- This design change is intended to allow VES to meet the dose acceptance criteria specified in GDC 19 with an increased unfiltered air in-leakage rate.
- The staff is currently reviewing the proposed design change.
- The staff will complete review of the control room dose analysis upon completion of review of the proposed design change.

# Backup Slides

# Change of Pressurizer Water Level Setpoints to Accommodate Pressurizer Dimension Change

- High-3, High-2, and High-1 pressurizer water level setpoints are changed to be consistent with design change in pressurizer dimension
- Percent of water levels for each setpoint is reduced to maintain the same water volume of each corresponding setpoint
- Westinghouse also proposed reactor internal changes by adding a flow skirt in the lower reactor vessel head and four neutron panels on the core barrel
- In response to RAI, WES evaluated the effects of these changes to Chapter 15 safety analyses
- The evaluation results show these design changes have minimal impact on safety analysis results, and the applicable acceptance criteria for the limiting design basis events continue to be met

# AP1000 DCA Chapter 15.0
# Replace P-8 with P-10 interlock

- P-8 interlock is power range neutron power above interlock that permits a reactor trip on low flow or reactor coolant pump high temperature in a single loop
- P-8 interlock is deleted because AP1000 is not licensed for N-1 loop operation
- P-8 interlock is replaced by P-10 interlock, which functions as P-8 for multiple loop but has a lower setpoint
- In Sections 15.3.1.1 and 15.3.2.1, replace P-8 with P-10 permissive interlock for a reactor trip on low flow in either hot leg for partial and complete loss of flow
- The staff find the replacement of P-8 with P-10 interlock acceptable because P-10 has a lower setpoint and therefore conservative

# AP1000 DCA Chapter 15.0 Change of CVS Isolation Valve Closure Time

- The chemical and volume control system isolation valve closure time is changed from 10 seconds to 30 seconds
- Safety analysis for inadvertent CVS actuation and loss of normal feedwater events assume a 10 s valve closure time (+ 2s microprocessor time delay)
- 20s difference in makeup valve closure would increase 15 $ft^3$ of makeup flow into RCS based on makeup flow rate
- Sufficient margin exists in pressurizer volume to accommodate additional makeup flow
- Boron dilution events in Modes 1 and 2 not adversely affected because CVS purge volume is not sufficient to return reactor to criticality
- Boron dilution events in Modes 3, 4, and 5 assume makeup closure time of 28 s. Sufficient margin exists to accommodate 2 s difference in valve closure time.

# AP1000 DCA Chapter 15.0
## Deletion of Active Failure Pertaining to Operator Action Error

- Certified DCD Rev 15 states that a single incorrect or omitted operator action in manipulation of safety related equipment in response to an initiating event is considered as active failure
- DCD Rev 17 deletes active failure consideration for operator action error
- The staff finds this acceptable because no operator action is credited in safety analyses of design basis events, except for small sample line break outside containment
  - Safety analysis of a sample line break assumes operator action to isolate sample line at 30 minutes after the break
  - Both sample line isolation valves inside and outside containment open only during sampling, a loss of sample flow provide an indication of sample line break to area and air radiation monitors
  - Since operator receives multiple indications of sample line break and can take corrective action within 30 minutes, no single failure was assumed for operator action (accepted in NUREG-1793)

# AP1000 DCA Chapter 15.0

## DCD Documentation Changes for Clarification and Consistency with Safety Analyses

The following changes made to DCD Tables 15.0-4a, 15.0-6 and 15.0-8 for clarifications and consistency with safety analyses of respective events, no changes made to analysis assumptions and results:

- Changing term "High-1" to "High-2" containment pressure for "S" signal or ESFAS (TS)
- Changing High-2 SG setpoints from 100% to 95% NR level span, adding ESF and CMT actuation on low pressurizer water level (SGTR)
- Crediting MSIVs, SFW isolation, and accumulators credited (inadvertent opening of a SGSV and SLB)
- Crediting SGSVs (inadvertent operation of CMT during power operation)
- Crediting low steam line pressure ESF actuation function (increase RC inventory due to CVS malfunction)
- Crediting sample line isolation valves (failure of small lines carrying primary coolant outside containment)
- Changing moisture separator reheat steam supply control valve to 2$^{nd}$ stage steam isolation valves as MSIV backup.

# AP1000 DCA – Sections 15.2.6 – 15.2.8
## Loss of AC to Auxiliaries, Loss of Feedwater Flow, and Feedwater Pipe Break

- In Section 15.2.6.2.1, delete statement "conservative PRHR heat exchanger heat transfer coefficient (low) associated with low flow rate caused by the reactor coolant pump trip are assumed," for the analysis assumption of the loss of ac power to plant auxiliaries event.
- In Section 15.2.8.1, add High-3 pressurizer water level as a reactor trip function for the analysis of feedwater system pipe break event.
- These are DCD documentation changes for clarification and consistency with the safety analyses

# AP1000 DCA – Sections 15.3.1 – 15.3.2 Partial and Complete Loss of Flow

- In Sections 15.3.1.1 and 15.3.2.1 of partial and complete loss of flow events, respectively, P-8 interlock is replaced with P-10 interlock to permit reactor trip in either hot leg
- P-8 is power range neutron power permissive interlock permits a reactor trip on low flow in a single loop, and is deleted because AP1000 is not licensed for N-1 loop operation
- Replacement of P-8 with P-10 permissive interlock is acceptable because P-10 interlock has lower setpoint than P-8, and is therefore conservative

# AP1000 DCA – Section 15.4.1 "Uncontrolled RCCA Bank Withdrawal from a Subcritical or Low-Power Startup Condition"

- Westinghouse proposed to no longer allow the trip function to be manually bypassed after the coincident two out of four nuclear power range channels are manually reset.
  - This trip function is designed to be actuated when the positive rate of change of neutron flux on two out of four nuclear power range channels indicate a rate above a preset setpoint.
  - Previously, this trip function could be manually bypassed after the coincident two out of four nuclear power range channels were manually reset.
- The proposed change is conservative and has no effect on the analysis results for the RCCA from Subcritical transient and the staff finds it acceptable.

# AP1000 DCA – Section 15.4.3
# "Rod Cluster Control Assembly Misalignment"

- Westinghouse proposed to delete a sentence from the application that states "If the rod deviation alarm is not operable, the operator takes action as required by the Technical Specification."
  - The deviation alarm alerts the operator to rod deviation with respect to the group position in excess of 5 percent of span.
  - Revision proposed to be consistent with TS 3.1.4 and TS 3.1.7 which do not require the rod deviation alarm to be operable.
- The proposed change does not affect the safety analysis of the RCCA misalignment events and the staff finds it acceptable.

# AP1000 DCA – Section 15.4.8
## "Spectrum of RCCA Ejection Accidents"

- Section 15.4.8 of the AP1000 DCD does not alter the rod ejection analysis
  - Revision 3 of SRP Section 15.4.8 is not therefore not used for review.
  - Any future design changes that require a revision to the DCD Section 15.4.8 analysis will be reviewed against the latest SRP revision.

- The Rev. 15 descriptions of the effects of rod travel housing longitudinal and circumferential failures were removed

# AP1000 DCA – Sections 15.5.1 & 15.5.2

## "Inadvertent Operation of the Core Makeup Tanks During Power Operation" & "CVCS Malfunction That Increases Reactor Coolant Inventory"

Westinghouse proposed the following changes:

- to change the operator action time to reduce the increase in coolant inventory from 30 minutes to 60 minutes after a reactor trip
  - Westinghouse states the DCD should have always cited "60 minutes after reactor trip" instead of 30 minutes which was a typographical error.
  - No new analysis was performed for Revision 17 and the current results, figures, and tables already reflect the 60 minute operator action time.
  - This change is editorial and the staff finds it acceptable.
- to add text stating "The main feedwater flow measurement supports a 1-percent power uncertainty; use of a 2-percent power uncertainty is conservative"
  - This change is consistent with Revision 17 DCD Section 15.1.
  - This change is editorial and the staff finds it acceptable.

## AP1000 DCA – Sections 15.5.1 & 15.5.2 (cont.)
### "Inadvertent Operation of the Core Makeup Tanks During Power Operation" & "CVCS Malfunction That Increases Reactor Coolant Inventory"

- to delete the sentence "No single active failure in any of these systems or equipment adversely affects the consequences of the accident"
  - For both events, the worst single failure assumed is the failure of one of the two parallel isolation valves in the outlet of PRHR heat exchanger to open
  - The statement is contradictory to the actual analysis assumption, and therefore deleted

# AP1000 DCA – Section 15.6.1
# "Inadvertent Opening of a Pressurizer Safety Valve or Inadvertent Operation of the ADS"

- Westinghouse proposed to change the motor operated valve stroke times for ADS valves Stages 1-3 and include clarification text explaining the effects on analyses.
  - These changes provide additional clarification and do not have a safety significant affect on the existing safety analysis of the event.
  - The staff finds these changes acceptable.
- Westinghouse proposed to change Table 15.6.1-1 to show the correct trip function modeled in the analysis.
  - The current table states that the low pressurizer pressure trip is credited, however, the calculation note associated with this event states that the Overtemperature DT reactor trip is modeled in the analysis.
  - This change is being proposed so that DCD Table 15.6.1-1 will be consistent with the calculation note.
  - This change is editorial and corrects an error in the current document and the staff finds this change acceptable.

# Confirmatory Items

TO Be implemented in the next AP1000 DCD revision:

- CI-SRP15.0-SRSB-02
  - Incorporate COL Item 15.0-1 on verification of 1% power measurement uncertainty
- CI-SRP15.0-SRSB-04: Correct the following DCD Inconsistencies
  - (Section 7.3.1.2.4) Delete incorrect statement that ADS-2 and ADS-3 actuations are interlocked with ADS-1, and ADS-2 actuations
  - (Table 15.0-4a) Revise ADS -1 actuation on CMT low-level signal delay time of 30 seconds to 32 seconds.
  - (Table 15.0-4b) Correct listing of Table 15.6.5-1 to Table 15.6.5-10 for ADS valve opening times.
  - (Table 15.6.5-10) Add two notes:
    - Interlock for initiation of ADS-4A valves to ADS-3 actuation
    - ADS-4 valve opening time includes “arm-fire” processing delay
- CI-SRP15.6.5-SRSB-01
  - Revise Section 15.6.5.4A.5 to include results of sensitivity studies for isolation of CMT and PRHR
  - Revise Table 15.6.5-4