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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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ESBWR SUBCOMMITTEE

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TUESDAY

JUNE 22, 2010

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ROCKVILLE, MARYLAND

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The Subcommittee convened at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Dr. Michael Corradini, Chair, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

MICHAEL CORRADINI, Chair

SAID ABDEL-KHALIK

J. SAM ARMIJO

MICHAEL T. RYAN

WILLIAM J. SHACK

JOHN W. STETKAR

CONSULTANTS TO THE SUBCOMMITTEE PRESENT:

THOMAS S. KRESS

NRC STAFF PRESENT:

CHRISTOPHER BROWN, Cognizant Staff Engineer

AMY CUBBAGE

ZAHIRA CRUZ

MARIE POHIDA

JOHN WU

ROBERT DAVIS

DENNIS GALVIN

AMAR PAL

RENALDO JENKINS

DAVID MISENHIMER

GEORGE CICOTTE

TODD HILSMEIER

MARK CARUSO

ALSO PRESENT:

TIM ENFINGER

JERRY DEAVER

JOEL MELITO (via teleconference)

RICK WACHOWIAK

JOHN STRYHAL (via teleconference)

JAMES CASCONE

LEE DOUGHERTY

GARY MILLER

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

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

8:27 a.m.

CHAIR CORRADINI: The meeting will come to order. This is a subcommittee meeting of the Advisory Committee on Reactor Safeguards, the Subcommittee on the ESBWR. My name is Mike Corradini, Chairman of the Subcommittee.

Subcommittee members in, or soon to be in attendance, are Sam Armijo, Said Abdel-Khalik, Dennis Bry, John Stetkar, Michael Ryan, Bill Shack, and our Consultant Tom Kress.

The purpose of this meeting is to discuss the SERs for Chapter 5, Reactor Coolant System and Connected Systems; Chapter 8, Electrical Power; Chapter 11, Radioactive Waste Management; Chapter 17, Quality Assurance; Chapter 22, Regulatory Treatment of Non-Safety Systems; and Chapter 19, Severe Accidents PRA, in particular the Aircraft Impact Assessment which will be closed all associated with the ESBWR design.

The Subcommittee will hear presentations by and hold discussions with representatives of the NRC staff and the ESBWR applicant General Electric Hitachi Nuclear Energy regarding these matters.

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

Christopher Brown is the designated federal official for this meeting. The rules for participation in today's meeting had been announced as part of the notice of this meeting previous published in the Federal Register on May 28, 2010. Portions of this meeting may be closed to protect information that is proprietary to General Electric Hitachi and its contractors pursuant to 5 USC 552(b)(c)(4).

A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice. It's requested that speakers first identify themselves and speak with sufficient clarity and volume so they can be readily heard. Also, please check and silence all cell phones and Blackberries so we don't have unusual sounds.

We have not received any requests from the members of the general public to make oral statements or written comments. GEH has a phone line on for some of their technical staff to call on if they need assistance.

Is that phone line already on line?

MR. BROWN: Yes.

CHAIR CORRADINI: All right. I will simply mention at this point that we have had our first subcommittee meeting on what I'll call the final SERs and associated topics back in May where we talked topical reports. We are proceeding now this month with these chapters and we'll proceed additional months with other chapters in July, August, and September which is the set of final SERs with all the open items closed by the staff.

The focus mainly is on these chapters but I guess I invite the committee that if there are things that concern them or any clarification on the final SER comments to please bring them up so that we can clarify or list things that might need to be cleaned up.

Other than that, I'll proceed with the meeting and call on Amy Cubbage, Acting Branch Chief and the lead PM to kick off this.

MS. CUBBAGE: Thank you. Yes, I would like to just follow on to what the subcommittee chair was saying that with these six chapters we're going to cover today in the interest of time we're selected certain topics to cover and those are focusing on significant open items which are now closed and also on selected topics of ACRS interest from previous meetings that we pulled back from the previous meetings and looked at what issues were of interest.

Also we have two topics coming up this afternoon that will be a first-time presentation to the committee and that will be on Chapter 17, the risk-significant components and the methodology for the development there, and Chapter 19, Aircraft Impact Assessment.

As we go through these chapters we will have selected members of the staff available to address questions that may come up on topics that are not included in the presentation. We'll do our best to answer those questions. If we need to we can call additional people in.

With that I would like to turn over to GE, Jerry Deaver and Tim Enfinger, to start off with Chapter 5 this morning.

CHAIR CORRADINI: If I might, let me emphasize something, I guess, before we let GEH kick it off to reemphasize. The way we arrange this, as I had said back in May, we are basically taking these chapters, looking at the things we have identified in our letters, our interim letters, on these chapters and the focus will be initially that.

Also staff with GH are going to go through anything that was open of significance and discuss how it was closed off and we're done, and then the two new issues. The only thing I forgot to mention and emphasize is that the last thing on the agenda, which is Chapter 19, Aircraft Impact Assessment, will be closed so we'll use actually the break in the afternoon to, shall we say, filter and assess those who are in the room so the remaining of the session of that afternoon session will be closed.

MS. CUBBAGE: That's right. I expect the first five chapters discussed to be completely open but if GE identifies any information we get into, please alert us so we can close.

CHAIR CORRADINI: Okay. So, Jerry, you want to start us off or is it Tim?

MR. ENFINGER: Well, I'm just going to introduce Jerry. I'm Tim Enfinger, GEH Reg Affairs. This is my colleague Jerry Deaver with GEH Engineering. He's going to present Chapter 5.

MR. DEAVER: I'm Jerry Deaver. I'll lead the presentation at Chapter 5. This is a list of the things that we are going to cover. Basically they were open issues at the last meeting in Chapter 5 and there was the 2007 preliminary SER where there were 26 open issues at that time. At this time all are resolved and I'm going to cover one which was more interesting and we had several supplements. We had three supplements, RAI 5.4-59. We'll go through that one.

Then at the last ACRS meeting there were a couple topics that were of interest which generated new RAIs. That was RAI 5.2-70 related to IASCC of reactor internals, particularly the shroud. Then there was RAI 5.2-71 and its supplement which dealt with grinding and welding issues of reactor pressure boundary components.

Then another item that's come up since the last meeting is a code case that is relatively new. It's N-782 dealing with ASME code addition to be used on projects so I'll cover that item also.

The first issue is 5.4-59. This basically dealt with the shutdown cooling aspects of the reactor water cooling system particularly during modes five and six. That's during cold shutdown and refueling. There are basically two items of interest. One is the circulation flow, particularly if it gets short-circuited or not. The other is the elevation of the water level during shutdown which has an affect on the cooling rate.

I included this figure to help clarify the actual conditions during cooling. Basically we have steam separators which are in red and, in particular, the separators themselves or the upper part here, this is the area that actually separates steam and turns it back into reactor fluid. It has several exit points along the way and then the one at the bottom is what we point to as the lower exit point for returning flow.

Normal reactor water is typically in the middle of the separator skirt area here this being the skirt area so the normal water level is in this region. Then we have feedwater spargers. You see a full sparger here. We have six of them around the circumference. The objective is to balance the flow around the circumference. That is where the returning reactor water cleanup flow comes from that ties into the feedwater system.

Then we have the reactor water cooling sunction nozzle. We have two of them. One is directly below the feedwater nozzle. Then 180 degrees away we have the other one. We have six-speed water nozzles and we have two reactor water cleanup nozzles.

Typically the colder flow comes in to the feedwater in these many directions but we have the hot water being generated from the core is throughout the separator assembly and it flows down through the standpipes that you see here and gets mixed along the way.

CHAIR CORRADINI: What are some length scales since you brought up this really nice picture? Do you have approximate length scales so we can understand just the lengths?

MR. DEAVER: There is a scale at the bottom.

CHAIR CORRADINI: Is there a scale?

MR. DEAVER: Yes, but it's very small.

CHAIR CORRADINI: Okay. Sorry. I apologize.

MR. DEAVER: Eight feet.

CHAIR CORRADINI: All right. Got it. Thank you. Never mind. So it's approximately -- using that scale it's approximately eight feet from the sunction nozzle to the sparger directly above it? Or maybe more like six feet, excuse me?

MR. DEAVER: It's 1.7 meters.

CHAIR CORRADINI: I deserve that. Okay.

Fine. Thank you.

MR. DEAVER: Okay. So let's move to the next slide then. Okay. So there were basically two issues we were addressing. One was the circulation path which was in Response A here. We talk about the vertical separation of feedwater flow and the returning flow. We did a number of sensitivity studies to check to see what the affect would be if we didn't get complete mixing and we found we had a lot of margin associated if we had any complete mixing at different flow rates.

Then Item B there was a SIL-357 which dealt with the issues associated if the water level isn't high enough it doesn't cover the separators or up to the separator level. Then what happens is you don't get the closed loop cooling occurring and you just simply get heating in the core region. Obviously that's an abnormal condition. You would normally keep the water level up.

Specifically that's an issue that is out of tech specs if you are operating with the water too low. That is not a critical thing. It can be readily corrected and once you get the water level back up, then you can continue the cooling cycle again.

CHAIR CORRADINI: I'm sorry that I should remember this but under Modes 5 and 6 is there water level indication at that point that you would know where you were?

MR. DEAVER: Yes. There is always water level indication.

CHAIR CORRADINI: Okay.

MR. DEAVER: And then Item C just identifies that we did a significant amount of analysis to look at the variability of flows and mixing and what's the sensitivity of the mixing itself. We found that typically the mixing could be as low as .68, I believe, mixing factor and still facilitate cool down. The higher flows actually increase or lower the mixing function that you have to have to facilitate cooling so we studied that clearly.

And then Item B there were issues associated with the shutdown PRS where we had questions about the significance if cooling wasn't occurring so we addressed those issues and satisfied the questions that came in.

MEMBER SHACK: You needed .68. What do you have?

MR. DEAVER: Well, ideally you would have

1. You'd have complete mixing. During different conditions it will change a little bit but we expect it to be close to 1. I failed to mention earlier that this geometry is really typical of BWRs. We are not really doing anything differently here and so if we don't get the factor 1 it just means we are cooling slower.

MEMBER ABDEL-KHALIK: Is there much swell of the vessel during Mode 6?

MR. DEAVER: We're at shutdown cooling phase right at this point so there is really not much swell at that point. As part of this issue we looked at when we flood up and we are taking the vessel head off and what is happening in the core so there were a lot of nuances that were studied in this RAI. Basically we concluded that we were always able to keep the cooling loop intact and that as such we replace cooling.

MEMBER ABDEL-KHALIK: So the steam separators are pretty much full of water?

MR. DEAVER: Really when you are still generating heat in the core you are introducing steam into the separator you've still got steam but then the water is picked off and returned to the downcomer region. Ultimately when the head comes off and we take off the steam separator themselves then everything is flooded.

MEMBER ABDEL-KHALIK: So what would be the maximum quality in the separators during refuel?

MR. DEAVER: I don't have that figure. During refueling?

MEMBER ABDEL-KHALIK: Right. It would be very low, wouldn't it?

MR. DEAVER: Right. I mean, actually all we're doing is we've got decay heat occurring and it's water and we'll get some thermal currents in the water but basically we have the reactor water cleanup system operating entirely throughout the refueling cycle and it's positioned at the top of the chimney so that it's picking up the water as soon as it comes out of the chimney so it's pure water at that point.

MEMBER ARMIJO: The separators and driers aren't even there.

MR. DEAVER: Right. They are removed at that point. No steam or bubbles particularly at all.

MEMBER ABDEL-KHALIK: All right.

MR. DEAVER: Okay. So in conclusion we made the changes associated with this RAI actually in DCD Revision 6 we have no additional changes following that.

CHAIR CORRADINI: Then changes were what, though? I thought it was more of a clarification. I guess I didn't understand that.

MR. DEAVER: What we did is we added a lot of verbiage as to what was happening during the cool down.

CHAIR CORRADINI: Oh, okay. So work verbiage, not changes in design. No change in design.

MR. DEAVER: No changes in the design at all. Then we have analytically shown that incomplete mixing can be tolerated and it's not going to be a technical issue. One of the other aspects was, okay, you have a temperature differential occurring in the vessel.

Does it generate any thermal fatigue and we answered that question also. The temperature differential is like 21 degrees centigrade and it's not large enough to really cause a thermal fatigue issue. The design permits passive response to mitigate loss of shutdown cooling.

MEMBER ABDEL-KHALIK: I'm sorry. I may have missed what you said. What were the main changes resulting from this RAI?

MR. DEAVER: They were word changes.

MEMBER ABDEL-KHALIK: Word changes.

MR. DEAVER: Yes, in the DCD better describing the cool down function, what was happening during different parts of the cool down.

MEMBER ABDEL-KHALIK: No physical change.

MR. DEAVER: No physical change, no.

MEMBER ARMIJO: Is the flow through the RWCU greater in this system than in conventional BWRs? Three percent versus 1 percent or am I confused?

MR. DEAVER: Well, the one thing that is changed for BWRs is we had an RHR function before.

MEMBER ARMIJO: Right.

MR. DEAVER: So really the reactor water cleanup system now covers both functions so it operates at a higher flow rate during the shutdown cooling but during operation it's only at 1 percent of feedwater flow. There it's just doing the cleaning function. We basically combine this system with the RHR function.

MEMBER ARMIJO: But it's still a 1 percent flow system?

MR. DEAVER: During shutdown it's more like 7.5 percent.

CHAIR CORRADINI: Yes, it matches essentially.

MR. DEAVER: It's a closed loop. We're pulling flow off and returning it.

MEMBER SHACK: But you said it's 1 percent at normal operation. That's correct.

MEMBER ARMIJO: That was my question.

MR. DEAVER: Okay. The next topic was RAI 5.22-70. There were two issues. One was basically asking our plan for mitigation of IGSCC and IASCC at the core shroud. The other issue was associated with mitigating devices or things that we could to help mitigate IGSCC and IASCC in the core shroud.

Basically as far as the IASCC is concerned we added information into the DCD associated with the fluence level which is five times ten to the 20th neutrons per centimeter squared. And the fact that material hardening and segregation would occur at that level of fluence. We also acknowledge that improvements in water chemistry, particularly hydrogen water chemistry, would be beneficial to both limit susceptibility to IGSCC and IASCC. That was better clarified.

MEMBER ABDEL-KHALIK: With typical core

designs how long would it take to reach that fluence?

MR. DEAVER: Let's see. I don't know the exact timing. It's obviously before 60 years. Our shroud is essentially the same distance from the fuel as in prior BWRs so we reach that level even in the existing BWRs at 40 years.

CHAIR CORRADINI: Somewhere between 40 and 60. Is that what I hear you say?

MR. DEAVER: I believe that's right.

MEMBER SHACK: I think it's about 20 to 40.

MEMBER ARMIJO: I think it's a lot sooner than that.

MR. DEAVER: It probably is because we have seen some affects by CC in plants that are approaching 30 years so that's probably more accurate.

MEMBER ARMIJO: Could you clarify the water chemistry control? In the DCD you do not have a hydrogen water chemistry system as far as I know, or has that been changed? Proposed Certified Design for ESBWR.

MR. DEAVER: Right. Nothing has changed in that regard. We provide the option to attach or include hydrogen water system so we have all the connections and instrumentation set up but it's an option that the COL holder would --

MEMBER ARMIJO: You would expect or be recommending that the COL holder do that because of the protection of the core internals?

MR. DEAVER: Right.

MEMBER ARMIJO: Okay.

MR. DEAVER: Particularly the bottom head is the region that would be protected the most in that scenario. We do recommend and in the different COL applicants are planning to use hydrogen at this point.

MEMBER SHACK: This shroud is bolted in, though, right?

MR. DEAVER: Yes. That's a belt and suspenders approach in the event something happens just in case.

MEMBER SHACK: Are you really proposing to solution anneal the shroud?

CHAIR CORRADINI: Yes. We think it's feasible. We recognize that --

CHAIR CORRADINI: What did you say?

MEMBER SHACK: Big furnace.

MR. DEAVER: Yes. We've actually located

furnaces and our biggest concern is distortion and we'll have to have a lot of fixturing. We found in the past that if we do a water quench it does cause a lot of distortion because you have unequal cooling rate. We found if you do an air quench, blow air and allow it to cool at a little slower rate --

MEMBER SHACK: Are you really sure you can cool it fast enough so that you're doing yourself good rather than harm?

MR. DEAVER: Yeah. You know, it's not that thick.

MEMBER SHACK: That's true.

MR. DEAVER: It's two inches. Of course, we have to actually further contract and actually demonstrate it can be done but our intention right now is to do a solution. We think that will take care of all the residual stresses and the surface stresses and that will be a complete solution for the shroud.

MEMBER ABDEL-KHALIK: How fast would you have to cool it? Is that possible for cooling with air for a two-inch thick piece of steel?

MR. DEAVER: You have to recognize that we're starting with the low carbon material. We've seen cases where even when material has been abused with heat treating and such on the early BWRs that it doesn't crack. Obviously you want to cool it down as quickly as possible.

You want to get it out of the sensitizing range as quick as possible. By doing all the tests for sensitization and understanding that it's resistant, then the rate is not as important but we will want to take it down as quickly as possible just to make sure we're not introducing issues.

MR. DEAVER: So as preventive measures, like I said, we're using .02 percent or lower carbon. We have process controls, water chemistry controls. We are locating wells away from the high fluence region in order to minimize the affect of IASCC. We have discussed the fact that our intention is to solution anneal the shroud.

We believe these are the measures that will be effective in mitigating both IGSCC and IASCC.

MEMBER SHACK: When you get right down to it that really is probably your best solution for the IASCC problem. You could do all sorts of things to get rid of the IGSCC but getting rid of the stress that is the only guaranteed way.

MR. DEAVER: And we have a solid top guide which is the next highest-fluence component so it won't have any wells in it either. I think that will be a good solution.

MEMBER ARMIJO: The top guide is that a casting or --

MR. DEAVER: It's a forging.

MEMBER ARMIJO: So it's machined out of a big forging?

MR. DEAVER: Yeah, we make a plate that is 5.75 inches thick and then we machine the cells out of it so it's a lot of machining.

MEMBER ARMIJO: It's a no nonsense approach, isn't it?

MR. DEAVER: That's what we've been doing for ABWR and that was successful.

MEMBER ARMIJO: Okay.

MR. DEAVER: Okay. Moving on to 5.2-71. This deals with the controls on welding and also on grinding to avoid issues associated with cold work. Since Chapter 4 deals with reactor internals and Chapter 5 dealt with the reactor pressure coolant boundary we basically made both sections refer to the other and so we effectively changed both.

With regard to welding to be able to better control welding we added requirements for thorough cleaning of weld preps so there are no contaminants. We are requiring protective gas purge on the back side of welds. We are prohibiting the use of the small process because it introduces contaminants in the root pass. We are doing visual examinations on each weld pass so this should improve the ability to reduce weld defects.

Then with regard to cold work itself when we've had grinding or other identified cold work we limit the cold work by hardness controls. We have bend radii controls when we are forming pieces. Then we have source finish controls. Then if we happen to have conditions that need to be corrected, then we would do a local or a full solution heat treating to anneal the component. We do a flapper wheel metal removal. We do control machining if we could just take out the layer of cold work. Then mechanical polishing and electroplating is another way.

MEMBER ARMIJO: You don't mean electropolish?

MR. DEAVER: Yes, electropolishing. So these are all ways to mitigate the affects of cold work. We minimize well defects and then any affects on the grinding. Typically some amount of grinding on the welds and such for inspection purposes is necessary in some cases. Our solution is to work with suppliers that minimize the need for grinding is our intention.

Okay. Then we have Code Case N-782. This was a fairly recent code case, as I mentioned. It asked the question what effective edition and addenda cases should be used in lieu of NCA-1140. There's a couple paragraphs that currently define it has to be within three years of the docketed application for the construction permit or it has to be within the latest edition and addenda endorsed by the regulatory authority which causes when they are built to have different editions and addenda of the code.

The reply was and the opinion of the committee that the edition and addenda endorsed for the certified design could be used for licensing purposes. What this does it allows ESBWR to have one code edition and addenda to be used for all plants built under the license. This simplifies life by locking in basically the edition and addenda.

If we go to the next slide. So we've incorporated this into DCD Rev. 7 and Table 5.2-1. As I said, this will basically mean that the code edition and addenda will remain the same. Experience with the code is that it doesn't really change much in time anyway. The fundamentals remain the same. What it will do it will allow the ASME equipment documentation to basically be refused. Of course, we would have to do reconciliations if there are deviations in that but, in essence, it will simplify the code documentation and the closure of ITAACs. Of course, all the ASME code requirements would still be fully met.

In summary, we have basically resolved all the open items. There is one item that will be covered at a later time associated with hydrogen detonation which has a small impact on Chapter 5 and Section 54.6. It's just a fairly minor modification.

At this point components exposed to reactor water we believe are now more robust with better control over the melting and grinding and initial fabrication of the components. Based on operating experience we have now improved the fabrication processes and methods to be implemented in producing reactor internals.

CHAIR CORRADINI: So the 5.4-6 will pick up in July when we discuss Chapter 6?

MR. DEAVER: Right. We'll cover all the

things associated with that.

CHAIR CORRADINI: Any other questions by the committee?

John.

MEMBER STETKAR: There was an open item that has been closed regarding drywell leakage monitoring.

MR. DEAVER: Okay.

MEMBER STETKAR: I see you're resetting something since it's obviously nothing that you have prepared for this presentation. This is kind of a minor point of clarification for me because I got confused by a statement in the DCD. The staff had questions regarding your setpoint of 5 gpm for allowed leakage and why that is higher than other people have instituted. Apparently, let me call it a compromise, you say that you've established a rate of change alarm.

MR. DEAVER: Yes.

MEMBER STETKAR: What it says in the DCD is a rate of change alarm setpoint is established at a lower limit value of 8.33 liters per minute, 2.2 gpm. 2.2 gpm is not a rate of change.

MR. DEAVER: No.

MEMBER STETKAR: Is that the leakage rate at which the rate of change --

MR. DEAVER: Will start to be monitored.

MEMBER STETKAR: Will start to be monitored but there is no specification of what that rate of change would be. In other words, it's not an increase of 1 gpm per hour or per day or per year or per minute. There is no specification of that rate of change.

MR. DEAVER: What we are trying to do is anticipate is this --

MEMBER STETKAR: I understand that but -- I understand the purpose. I'm glad you clarified that it starts at 2 gpm. It doesn't start at 1 gpm which is something you claim you can monitor. Obviously the predictive capability of that depends on the value that rate of change is monitoring.

In other words, do you get the alarm at a rate of change of 1 gpm per year? It will come in pretty easily. Or is it 1 gpm per second in which case it doesn't give you very good predictive capability.

MR. DEAVER: I think it's really anticipating reaching the five gallons per minute.

MEMBER STETKAR: I understand that and I

was curious whether the tech spec should have a specification on the rate at which that alarm --

MR. DEAVER: I think we left that purposely open-ended because it can be a gradual change or it could be something that changes and then stops. There are all kinds of scenarios associated with the rate. I think mainly what it's doing is it's giving the operators an indication that there is an issue and that they need to start --

MEMBER STETKAR: My concern us the setpoint for that rate determines its efficacy in terms of giving the operators that forewarning. If the setpoint is a very rapid change, it doesn't give them very much forewarning. On the other hand, if it's a very slow change, it also is not very useful.

MR. DEAVER: I think the history was that actually we had 5 gpm before. For ABWR it got changed to 1 but then when we tried to design for it we found we couldn't.

MEMBER STETKAR: Right. I understand the concern. I agree with you wholeheartedly but as long as you have specified this rate of change alarm as a way to satisfy these concerns, I was just curious whether there should be any specification of what that rate is or whether it's a variable rate. I guess I don't know how it would be implemented.

MR. DEAVER: I guess at a point in time it specifically brings to the attention the leakage issue to the operators. There are certain things that they can do to better understand it.

MEMBER STETKAR: Well, let me understand. Does this alarm simply come in when the leakage rate exceeds 2.2 gpm? In that sense it's not a rate of change alarm, it's just an absolute leakage rate alarm. If that's the case, then I understand what it's doing. On the other hand, if it is actually a rate of change alarm, which is measuring the change in the leakage rate as a function of time --

MR. DEAVER: I think mainly what we were trying to do is we know that we have a low-level of leakage generally in the plant so we didn't want to target something that was so low that you're always chasing it and trying to figure it out. I think the 2.2 was an attempt to kind of set a level that things under that are kind of --

MEMBER STETKAR: But from what you just said it's not a rate of change alarm. It's simply a leakage rate alarm.

MR. DEAVER: Yes.

MEMBER STETKAR: Is that the way to understand this?

MR. DEAVER: I haven't reviewed this recently and I don't want to say anything incorrectly.

MEMBER STETKAR: If it's an absolute leakage rate alarm I understand what it's doing. It's a forewarning but that is not a rate of change.

MEMBER ARMIJO: I would have been 2 gpm per hour or something.

CHAIR CORRADINI: So, Jerry, why don't you take this to the side and see during the day if we can just clear it up. I don't think it's a big issue but, on the other hand --

MEMBER STETKAR: I just stumbled over the term "rate of change alarm" and what it was doing.

MR. DEAVER: One thing we could do if Joe Melito is one the line, he might be able to address it now.

Joe, do you have anything to say in that regard?

MR. MELITO: This is Joe Melito. That alarm as we resolved in the RAI on that is 2.2 gpm increase in one hour.

MEMBER STETKAR: Ah, okay.

MR. MELITO: Rate of change alarm.

MEMBER STETKAR: Okay. 2 gpm per hour. Thank you because that was not elaborated in the SER. It's 2 gpm per hour. Thank you.

MR. MELITO: That was the resolution of the RAI, yes.

MEMBER STETKAR: Thank you very much. Don't be shy. You could have jumped in earlier. Don't run away. Is that 2.2 gpm per hour actuated at anytime? It is not predicated on any initial leakage rate as a threshold?

MR. MELITO: Right. It's just a change within a one-hour time period that the leakage has increased by 2.2 gpm.

MEMBER STETKAR: Great, great, great. Thank you.

CHAIR CORRADINI: Okay. Other questions?

MEMBER ARMIJO: I have a question.

CHAIR CORRADINI: Sam, go ahead.

MEMBER ARMIJO: At some point in earlier meetings the reactor vessel there was some discussion whether the vessel would be fabricated or assembled in the field in big components or whether it would be built in the factory and ship to the site.

I thought the last time I heard you

decided that you were going to build it in the factory and ship it to the site. Now I see in the SER that decision is TBD and it will be handled as an ITAAC. Could you clarify that, Jerry?

MR. DEAVER: Well, the plants or the customers we were working with we fully intended to complete the vessel and ship as a complete vessel. That was clear. That hasn't changed since out last meeting. We are finding there are some customers like in Switzerland where it's been traditional that they assemble vessels at the site.

As a matter of fact they just are land-locked and have those issues. We were just recently discussing that issue with them. Our intent is to complete the vessel as a complete vessel where we have that opportunity and can bring it to the site.

CHAIR CORRADINI: Is this a flexibility issue? I guess I'm still not --

MEMBER ARMIJO: It's a very big vessel. Other vessels, big ones, Clinton or Limerick were site-assembled but this is a really big vessel and I'm just wondering if that is the first of a kind.

MR. DEAVER: Typically diameter is the issue. Length isn't such a factor if you're turning.

MEMBER ARMIJO: Okay. So that's your

argument. You think if you have assembled things of that diameter before successfully this is just one of the same?

MR. DEAVER: Certainly this is a little larger than we've done before. Our past plants have been diameters up to 251 inch and here we're at 280. It's larger. Creates more challenges. If the transportation study shows that it can be brought in as one piece, that's our preference.

CHAIR CORRADINI: Okay.

MEMBER ARMIJO: Thanks. But it's now an ITACC, this unit. If I read the SER right it's now a decision on how the vessel is assembled is an ITACC somewhere in here. I guess that's okay if that's okay with the staff.

MR. DEAVER: Effectively local post-weld heat treatments after welding are effective and don't represent any degradation in the process. It's more of an economic issue. You would rather do it in one piece.

MEMBER ARMIJO: Sure. If you can't get it there, you can't get it there.

MR. DEAVER: Right.

CHAIR CORRADINI: Okay. So than you very much.

Do we have a presentation now by the staff?

MS. CUBBAGE: Yes.

CHAIR CORRADINI: Thank you, gentlemen. We'll see you soon, or some of you.

Ms. Cruz, are you going to kick this off?

MS. CRUZ: Yes.

CHAIR CORRADINI: Great.

MS. CRUZ: Okay. Good morning, everyone. My name is Zahira Cruz and I'm the Project Manager for Chapter 5. Today the staff will be presenting two topics. One is the RAI 5.4-59 solution will be presented by Marie Pohida. This actually is discussed in Chapter 19 of the SER, the PRA calculations we did.

Then John Wu will be presenting the request from the applicant, a new code case. Then I will turn it over to Marie.

MS. POHIDA: Thank you very much. I'll proceed to slide 2. We are discussing open item 5.4-59. The basis of this RAI was to support the staff's understanding of shutdown risk. We requested information on the minimum vessel level to support RWCU shutdown cooling operation and basically to make sure we had adequate circulation.

Also we wanted to understand the potential for RWCU shutdown cooling flow to bypass the core due to inadequate missing in the downcomer.

The basis for this RAI was that this design is different than current operating PWRs where the inlet and the outlet flow is at mid-vessel with the exception of the RWCU drain line. We also want to understand how the GE service information letter 357 was being met.

This service letter discusses the need for adequate vessel level to ensure adequate core circulation between inside and outside the shroud. There have been a number of shutdown events where core circulation has been interrupted with resulting reactor heat up and repressurization.

I would like to proceed to slide 3, please.

MEMBER STETKAR: Be careful about your paper on the mic there. The reporter is going to go crazy.

MS. POHIDA: I'm sorry?

MEMBER STETKAR: And you really don't want him to do that. You have a nice voice to project. There you go.

MS. POHIDA: My voice unfortunately is

not soft. In response to RAIs on the issue GE significantly updated the DCD to include the minimum vessel level to support shutdown cooling circulation and it's the first stage spill of the steam separators.

We also did a detail discussion on preventing thermal stratification by maintaining vessel levels sufficiently above minimum level. There is also a discussion of mixing within the vessel.

I would like to proceed to slide 4, please. To confirm these DCD updates and GE's simplified calculation for core temperature response within the RWCU shutdown cooling model. The office of research performed three dimensional CFD calculations on RWCU shutdown cooling flows.

We got the geometry and the mesh model from GE and the CFD model includes the downcomer region, the space around the seed separators, the inlet feedwater spargers, and the lower plenum detail.

What we've concluded that downward flow from the separator spillover interacts with the horizontal jets from the feedwater spargers so these spargers physically spread the incoming flow and the flow interacts with the separator geometry and the spillover flow results in high turbulence and mixing so we were able to resolve the RAI.

That concludes my discussion.

CHAIR CORRADINI: Before you conclude, this is a note between research and NRO, the analysis?

MS. POHIDA: A note?

CHAIR CORRADINI: Well, internal memo. I don't remember. I was asking a friend. I can't remember if we've seen this. That's what I guess I was getting at.

MEMBER SHACK: How is this documented?

CHAIR CORRADINI: I don't remember a presentation on it. I guess that's what started it.

MS. POHIDA: The two times we went to the ACRS the calculations were not completed. The calculations were sent to NRO via a letter report from the Office of Research.

CHAIR CORRADINI: Okay.

MS. POHIDA: I can provide you the ML numbers if you would like.

CHAIR CORRADINI: We'd like that.

MS. POHIDA: Okay.

CHAIR CORRADINI: We love ML numbers.

MS. POHIDA: Is there any further questions? All right. Thank you very much.

MS. CRUZ: John.

MR. WU: My name is John Wu. I'm with NRO Engineering Mechanics Branch. I'm going to review GE additional request to ASME Code Case N-782 in DCD. Here previously from the presentation they had Code Case 782 in there because there is a limitation in the 50.55a(c). There is a requirement. 50.55a require a code edition and addenda date must be determined by the requirement of os ASME Section 3 NCA-1140. 1140(a)(2) has two limitations on the date. This limitation is presumed by GEH.

The code edition and addenda cannot be three years earlier than the date of the construction permit application was docketed and cannot be earlier than the latest code edition and addenda than those by the regulatory authority.

The first one now we have North Anna application coming in which is a COL application coming in 2007 and the permit coming in in 2008. The code edition and photo design for the ESBWR was from 2001 through 2003 addenda so there is a four-year gap.

This is obviously some kind of not

compliant with 1140 as we say here so they to require in the request the addition of ASME Code Case N-782 in the DCD in order to comply. Code Case N-782 which say the code editions and addenda in those for design saved by or licensed by regulatory authority can be used. There is no limitation on the date so will get around the time limitation required and submit it to the DCD.

Well, in the DCD otherwise we love that in the DCD. We probably need that to put in every COL application. Every COL application need to have the difference code editions and addenda in order to satisfy NCA-1140. GEH say in the request, and we have reviewed, because the Code Case N-782 is not recorded in the 1.84, Revision 34, therefore, you are based on 50.55(a), item (b)(1)(4).

Therefore, it's not incurred in 1.84. Code Case require the staff approval so they sent the Code Case in March and I review the Code Case and approved it. That coding was a requirement of 10 CFR 50.55(a)(3)(i) and (ii). (3)(i) says that this 782 is alternative rule to NCA-1140.

(3)(i) is proposed alternative rule where it provides acceptable level, quality of the level. (ii) is also like this. Also if the proposed alternative to aid some kind of hardship without increase, without gaining the benefit of the increase the level of quality.

One is we look at if it's a design code edition and addenda in the design already certified licensed by the staff, today it won't be the same as two years from now because the same code edition and addenda. We certify already. We review every response so that would be the same so we don't lose any level of the quality.

Two is the day before I said GE indicate in their presentation they want to put that in the standard DCD rather than in COL application. You have to put it in the COL application every time they have to justify 1140.

MS. CUBBAGE: Okay. Is there any confusion on what this is for?

CHAIR CORRADINI: I think we understand.

MS. CUBBAGE: There's a Catch 22 in the regulations and we are highlighting it here because this is one of the few areas where the applicant needed an exemption in the certified design so there is an exemption to regulations that we're approving here to 50.55(a) and that's why.

CHAIR CORRADINI: Fine. Other questions?

Thank you for the clarification. Any questions?

MEMBER ARMIJO: Not on this issue but I want to get a clarification on RAIs that were closed out related to the isolation condenser from the staff.

MS. CUBBAGE: I think the reviewer just left because he felt we were passed that issue.

CHAIR CORRADINI: Retrieve the reviewer.

MEMBER ARMIJO: Whenever you can get him back.

MS. CUBBAGE: Sure. Actually, if you would tell me which RAI then the reviewer may be here.

MEMBER ARMIJO: It's 5.4-58 and 5.2-56.

MS. CUBBAGE: We'll have to try and get someone.

MEMBER ARMIJO: When you get somebody.

MS. CUBBAGE: The RAI numbers were --

MS. CRUZ: 5.4-58 and 5.2-59.

MEMBER ARMIJO: 5.2-56.

MEMBER STETKAR: You said 5.4-58.

MEMBER ARMIJO: There were two, 5.4-58 was on the material for the ICS tubes and then 5.2-56 related to inspection.

MS. CUBBAGE: Okay.

MR. DAVIS: What was the question? Okay. I'm sorry.

MEMBER ARMIJO: I haven't asked it yet.

MR. DAVIS: Oh, all right.

MEMBER ARMIJO: We have you now.

CHAIR CORRADINI: Go Sam.

MEMBER ARMIJO: The staff resolved these RAIs and one related to justifying the use of Alloy 600 for the isolation condenser tubes and GE presented a resolution and an explanation of why they chose that material. I don't have a problem with that. The thing I'm still confused is whether these tubes are subject to in-service inspection. The impression I have is that they are not subject to in-service inspection. I was wondering why the staff accepted that.

MR. DAVIS: There's been some recent changes obviously because of the hydrogen detonation issue so I have to go back and look it up but I know the PCCS is not going to receive any ISI because it's just that containment pressure and it just sits in demineralized water.

The ICS I can't recall off the top of my head what the final resolution of that was. I believe they are going to do a VT2 on those.

CHAIR CORRADINI: That's what I thought. That's what the SER says.

MEMBER ARMIJO: It is not volumetric

MR. DAVIS: No, it's not.

CHAIR CORRADINI: Let's get a clarification from the applicant. You guys --

MR. DEAVER: This is Jerry Deaver with GEH. The current response related to the hydrogen detonation committed to VT2.

CHAIR CORRADINI: Does everyone know what that is? Can you expand, please?

MEMBER ARMIJO: Look at it.

MR. DAVIS: I think you have to remember the thickness of these tubes, I mean they are extremely thin so if a crack were to form, I think from initiation to where you could detect it to where it would leak would be probably a very short period of time plus you would get a radiation alarm if you got a leak in one of those ICS tubes because it's pressurized during normal operation. It's just kind of in standby.

MEMBER ARMIJO: So you have some other method of knowing whether those tubes are leaking?

MR. DAVIS: We revisited this earlier

because we looked at the well joint design which I don't think they are a completely done design there but it's going to be kind of unique because it has to be a full pen weld onto those headers and the tubes are -- I don't know if somebody can -- I can't remember but they are extremely thin like 1.6 millimeters or something like that. We looked at that recently and determined that it would be unrealistic to ask them to do, say, eddy current or volumetric exam because --

MEMBER ARMIJO: Even on a sampling basis.

MR. DAVIS: More than likely. The only way they are ever going to find it is when it leaks because they are so thin. If you initiated that crack, the time to its leaking would probably not be very long.

MEMBER ARMIJO: I was just wanting to know if you knew that the isolation condensers would be in good enough shape to do their job when called upon and you're saying a radiation detector would find out that they were leaking because they are pressurized.

MR. DAVIS: All those welds are volumetrically inspected. Really they are butt welds where it goes onto the header. They are not like a partial pen jigger because they are so think there is no way you could do it any other way. Those all receive volumetric exams. I believe and PTs during initial fabrication.

CHAIR CORRADINI: Give your name, please.

MR. DAVIS: Robert Davis.

MEMBER ARMIJO: I understand.

CHAIR CORRADINI: You're okay, Sam, now?

MEMBER ARMIJO: Yes.

CHAIR CORRADINI: Other questions for -- are you departing?

MR. DAVIS: I'm not departing.

CHAIR CORRADINI: Any questions from the committee? Okay. We can move on to Chapter 8. Thank you very much for the staff and we may see you again.

So we're on to Chapter 8 from GEH. Is that correct?

MR. DEAVER: Yes.

CHAIR CORRADINI: Oh, look who's here. Mr. Wachowiak, welcome.

MR. WACHOWIAK: Good morning. Rick Wachowiak, GEH. I'm going to present Chapter 8. My air cover is being provided by Kevin Nunes and John Stryhal. They should be on the phone.

CHAIR CORRADINI: Can I check that?

MR. WACHOWIAK: Are you guys there?

MR. NUNES: Kevin Nunes.

MR. STRYHAL: John Stryhal.

MR. WACHOWIAK: All right. Whew, we're all present.

So in Chapter 8, which is the Electric Power Section, there were two open items from the previous SER. One of them was covered I think either two or three weeks ago on the battery qualification testing so we are not going to cover that here. We do have the one open item on the battery loading profile. Then we wanted to cover some other design details that had changed since the original SER was written. They are associated with battery type. The configuration is uninterruptible power supply and how that configuration addresses the Forsmark issue or event. And then the configuration of our ancillary diesel generators. We'll start out with the open item.

One of the questions that came up was considering what is the loading profile that is going to be put on the batteries and do the batteries have the sufficient capability to respond to that load profile.

We added information to the DCD to describe what the load profile expected on the batteries is. It's in Table 8.3-3. We also provided an ITACC to perform a test on the batteries given the design loan profile following construction. I have the profile listed here on a subsequent slide so we'll get to that. I have the profile listed here on a subsequent slide so we'll get to that.

Further information was asked in response to this concerning the battery capacity, the charger, what were the specs on the rectifier. We added another table into the DCD 8.3-4 that had provided the specifications for those components.

Let's take a look at the table that essentially we put into the DCD. The method that was used for this is based on IEEE 485, 1997. Basically we divided the DBA up into the significant time frames, none less than 1 minute because the methodology requires that any load you put on the battery has to be analyzed to be sustained for that minutes.

In a DBA LOCA we have the zero to one minute time frame. In that time period is when we actuate things like RPS and other protective system type of equipment, RPS mainly there. A one to five-minute time frame which there's not really that much going on other than monitoring. Five to seven minutes and seven to 15 minutes are when things like the DPVs and the GDCS squid valves are opening.

Seventeen minutes out to the first hour is essentially more monitoring. There is a few more accusations of things. And then everything is quiet from one to 72 hours. Out to the end it's essentially monitoring equipment and it's the steady-state loads that are on all of the RMU's.

You'll see that in our divisions Division 1 and 2 early on in that first minute there are additional loads there than on the other two mainly because the MSIV pilot solenoids are on that division. You'll notice also that on Divisions 3 and 4 out longer term into the scenario these are additional loads there because the hydrogen and oxygen monitors for the containment are on Division 3 and 4.

The calculations that we've done for these show that on Divisions 1 and 2 the calc that was used to respond to this RAI showed that there was about 20 percent margin on Division 1 and 2 and about 4 percent margin on Divisions 3 and 4. We've since done updated calculations and we think we can get more margin back than even that but those weren't in the application. The application still has the 20 and the 24.

MEMBER ABDEL-KHALIK: Do you really know the loads down to five significant figures?

MR. WACHOWIAK: No.

MEMBER ABDEL-KHALIK: So this table you could round it?

MR. WACHOWIAK: It could be rounded. That's correct. The loads that are in here are essentially estimated nameplate loads for the different equipment that we have. We've got the RMUs and the QDCIS cabinets and the other things so I would guess they could be rounded.

MR. STRYHAL: Rick, this is John Stryhal, GEH. All of the loads were rounded up and we rounded up to the next highest 100 watts going up on everything. We did that for all of the solenoid valves for the ICs. We did that for the squib firing circuits. In the very beginning that first on division 22, that's where solenoid valves are energized in the beginning. They are then de-energized but we retain that partial few seconds to show that we took that as IEEE 485 request that one minute. What happens is at the end of one minute our loads have substantially dropped with the actuation or de-actuation of the solenoid valves that are holding the IC valves closed.

MR. WACHOWIAK: Okay. So there was --

MEMBER ABDEL-KHALIK: It is listed to the one-watt level. Let's be reasonable.

MR. WACHOWIAK: I understand. So we move onto the battery type that we selected for the ESBWR. There was question early on the certification on what type of batteries we were going to be using. At one point we looked into valve-regulated lead acid batteries.

The main issue that we ran into with that is there really were no standards associated with that type of battery for nuclear power plant applications. After much study between us, our customers and the NRC we went back and looked into the benefits versus the issues that we would run into to use the different types of batteries.

Overall I think we determined that the VLA batteries, which are typically used in nuclear power plants today was our best option and basically gave us the most certainty for certification and for construction. Once again the qualification because they are a long discharge battery, 72 hours, versus eight hours.

That was discussed in the previous meetings so I wasn't going to go into that here. If you have any questions from before we can ask our people on the phone. There was shaking of heads here so we have no questions on that.

CHAIR CORRADINI: Not now.

MR. WACHOWIAK: All right. The uninterruptable power supply, our configuration is set up so that all of the safety related loads are being run off the uninterrupted full power supply so we don't have anything that is directly connected to the battery. I have a schematic on the next page that I'll show how that's arranged.

Each of our divisions has two uninterruptable power supplies. They share the load. We talked about this a year or so ago but if there are any further questions on that, we can entertain them now. Each uninterruptible power supply has a rectifier and a converter all combined into one unit. Normally power comes from the isolation power center and the standby power is from the 250-volt battery.

Let me just go on to the schematic. Like I had in text on the previous slide, normal power comes from the isolation power center down through the rectifier. This is arranged such that if there is a spike or some sort of an interruption from the isolation power center. It will disable the normal power supply line preferentially over the battery supply so that there is always a continuity of power. That was part of the RAI that addressed the force mark of that.

The other thing that we did to the configuration was we used to have a bypass transformer that provided power directly from the isolation power center down to the 125 volt uninterruptible line through a transformer.

It turns out that configuration can transmit volts from the isolation power center down around the 250 volt power supply and we removed that. There is no need for that transformer in our design. The best way to get rid of that failure mode was just to get rid of that component.

As I mentioned, all of the loads are down off the 120 volt uninterruptible power source. We don't have anything that is convected directly to the batteries so everything must come through the uninterruptible power supply.

MEMBER STETKAR: Rick, since you have

this nice picture up there and there was quite a bit of discussion in the SER about it, could you briefly tell us about the coordination of the protective trips on the invertor input, the invertor output, battery charger and such?

MR. WACHOWIAK: Okay.

MEMBER STETKAR: What gets cut off in what time.

MR. WACHOWIAK: For that discussion I'll ask John to go through those.

Tell me where to point, John.

MR. STRYHAL: Okay. This is John Stryhal, GEH. The in-volt voltages that could interrupt the invertor could come in through both the battery chargers for the two batteries or through the two invertor rectifiers which are just like battery chargers on other plants.

In fact, these are adjustable in voltage also but their voltage is always higher than the normal battery chargers but we get past that. We have a high-voltage transient. Not a surge from lightning. That's taken care of elsewhere and should not reach this point but a high-voltage transient will come all the way through the system as it did at

Forsmark.

It's sent in the initial input circuits that are firing the rectifier, the 12 close rectifiers we're using for both the battery chargers and for the rectifier for the invertor. It's sent and it trips that firing post off within one cycle. Within 2 milliseconds if the invertor -- there is a time delay also which prevents the invertor from tripping for 2 milliseconds on this kind of an input surge. Therefore, it can ride through the first cycle of surge that it gets.

This system has been presented. It has been tested by the -- we're using the same rectifiers and invertor that have been placed in Forsmark. We initially were going to use them anyway and we followed this from the inception of the Forsmark and so we followed what was done and what was successfully tested.

These rectifiers should protect the inverters both from surges going to island mode when we have to reduce power to our plant hotel load from 100 percent power. For a fault in the grid that comes through, or for a fault if we were to be on the standby diesel generators and a fault came through from those, it's always going to be stopped by the rectifier and keep from tripping the inverters.

If it were to trip and if one of the rectifiers were to fail on an invertor, the other one could still be there. Don't expect that to happen but that gives a single failure within each division and taking out the transformers, the regulating transformers, will prevent that surge from carrying through and causing damage to the electronic components within the system. We believe that we have placed the best protection currently available and known and tested to prevent these high voltage transients from carrying through.

MEMBER STETKAR: John, this is John Stetkar in case -- you can't see who is talking just for the record. I was writing notes as you were talking. Can you go back and just tell me again what the rectifier -- when you say rectifier, that's both rectifier and battery charger.

MR. STRYHAL: The rectifier and the battery chargers. The rectifier for the invertor is the same as the battery charger for the batteries. It's different units but they are made by the same company and they have the same input sensing circuit that prevents the firing of the thyristers, to stop the firing. Now, the ones that have already fired will fire through the initial cycle but they kill it., They kill the firing circuit so nothing further passes through. At the invertor there is a 2 to 3 millisecond time delay. I've slept since I've read the details of it. It allows the initial surge to be dampened within the invertor but prevents further -- if the time delay is over you are stripping on the battery so the battery silently transitions in at 250 volts or 245 or whatever it's going to show when it gets placed into service through diodes so the battery --

MR. WACHOWIAK: Hey, John.

MR. STRYHAL: Yes.

MEMBER STETKAR: What I was looking for John you mentioned the input trip setpoint. I think you said one cycle and you just reiterated --

MR. STRYHAL: The input remains tripped. I'll correct that. The input once it trips there was already --

MR. WACHOWIAK: John, let's get the question all the way out before you start answering.

MEMBER STETKAR: I was looking for -- you said -- I'm looking for the relative sensitivity and the timing on the rectifier input trip on a voltage spike versus the invertor output time delay. You already just mentioned that the invertor output time delay for this type of transient is 2 to 3 milliseconds.

MR. STRYHAL: That is correct.

MEMBER STETKAR: What is the sensitivity of the rectifier input trips signal? When do --

MR. STRYHAL: When it sees the first cycle up.

MEMBER STETKAR: One cycle.

MR. STRYHAL: Yes.

MEMBER STETKAR: Okay. Thanks.

MR. STRYHAL: When --

MEMBER STETKAR: We're good.

MR. STRYHAL: Can I --

MEMBER STETKAR: Thanks.

MR. WACHOWIAK: One of the things John was talking about on this system was the battery charger. This figure does not show the battery charger so just in case there was any confusion about that it's not on here.

MEMBER STETKAR: I thought that's the way it worked. I just wanted to make sure that I had the relative timing down.

MR. WACHOWIAK: One of the other things

that we had added to the design, and it was mainly in response to the regulatory treatment of nonsafety systems, or the RTNSS aspects of the design over the ancillary diesel generators. We'll talk some more about the RTNSS characteristic later this afternoon but I just want to cover the diesel generators now.

They are separate from the standby diesel generators, out standby diesel generators that we have that power the plant investment protection loads and the things needed for bringing the plant online and things like that. Those are separator generators.

These are smaller generators approximately in a 1 megawatt range, little bit larger than this. They are fairly small diesel generators. There are two of them, redundant. Essentially what we installed them for was to address the post-72 hour operation of the plant.

One of the reasons that we did that, and we'll get to this later this afternoon, things that are required for post-72 hour also need to have enhanced seismic capability because that's one of the things that need to be addressed by that. What we found was it's easier to make these two smaller generators meet all of the seismic requirements than it would be to go back and make the larger generators meet every one of the seismic requirements. That was the main reason why we went to this to segment out what actually needed the enhanced requirements.

We don't credit these in the first 72 hours so they are nonsafety related. They are used after 72 hours and they power things like the containment vent fans or PCCS vent fans that we talked about in previous meetings. They provide the control room HVAC for the long-term, post-72 hours, and various other loads which I have on the next chart.

They automatically start low voltage on the ancillary bus that brings these generators online just like you would expect. We also have low room temperature which would bring the generators online mainly so we are assured that the auxiliaries that are needed to start the generator are there and within the ranges of their operation so we added the low temperature start as well.

Hard to read on here. I think they are easier to read on your actual printed copies. Sorry not for the people in the back with the multiple-page ones but this figure is essentially in the DCD.

We have two generators. The ancillary

buses are provided by either one. I've shown one here but the other generator would be connected to essentially the same bus. We have normal power coming in from the PIP system and PIPV comes on the other side. You'll notice here that I have some of the loads marked with a star. Those are the loads for a RTNSS that actually brought us to needing these generators. We've got, as I mentioned, the PCCS vent fans, the auxiliaries for the generator itself, the main control room HVAC. They provide a backup power for Q-DCIS and you can see all the different things that come under Q-DCIS. All four divisions can be powered by these. We do have an additional pump that used to be in the design, a diesel-powered pump. I'm sorry, move back up. That is a different one. We took credit for our two fire pumps, the diesel fire pump and the electric fire pump and the electric fire pump is provided by this diesel generator.

MEMBER STETKAR: You still take credit for the electric --

MR. WACHOWIAK: These are the post-72 hour fire ponds. They are for refilling the pools. It's not the core injection which is a separate --

MEMBER STETKAR: Right, right, right. But you do take credit for the electric still?

MR. WACHOWIAK: Yes, because mainly, as we will see this afternoon, one of the requirements for RTNSS-B it needed to be single failure proof so we had to have two pumps to perform that function.

MEMBER STETKAR: Okay. Yes.

MR. WACHOWIAK: The other loads that we put on here we put on because we thought they were a good idea to have those additional loads, especially powering the non-safety-related DCIS circuits for continuity. Those batteries are two-hour batteries and we would like to give the operators as much flexibility and information as possible so these generators will pick up those loads to provide continuity. They are not required.

MEMBER STETKAR: I was going to say on a Design Basis Event they have been dead for 70 hours. Right?

MR. WACHOWIAK: If this was only the design basis of that but, once again, we don't delay starting these generators for 72 hours. We start those generators when there is no voltage. Those are other loads that make operating the plant and responding to the scenario easier, not necessarily required though.

MEMBER ARMIJO: Rich, I don't understand

the significance of a low-room temperature for triggering or starting these things. Why do you do it that way? What is so great about low-room temperature?

MR. WACHOWIAK: Well, remember this is non-safety-related stuff here. We wanted to have the flexibility of various designs. One of our issues that we ran into was what happens if we don't have this diesel generator start up right at time zero. A lot of times you say, okay, it starts at time zero. Well, if there is no degraded voltage on this bus right at time zero, it may sit there and it might be cold outside and we just want to make sure that the generator itself before it gets into any thermal problems will come online and start heating up the room for itself so it's not sitting dead for 72 hours and then we have to prove that it's going to start in -40 degree weather. That's what the low-room temperature is doing.

MEMBER ABDEL-KHALIK: And that setpoint is what?

MR. WACHOWIAK: I think that depends on the generator itself and when we inspect the generator we'll need to determine what that temperature is going to be. Any more questions on this. The requirements we'll get into this afternoon.

So I want to summarize that we have closed all the open issues with Chapter 8 and we've come to the point where the staff can present their SER if there are no more questions. Thank you.

CHAIR CORRADINI: Thank you, Rick. We'll see you again later this afternoon.

Dennis, are you --

MR. GALVIN: We're ready.

CHAIR CORRADINI: Are you bringing up the staff?

MR. WACHOWIAK: Thanks, John.

MR. STRYHAL: You're welcome.

MR. GALVIN: Okay. So we are here to present the advance final SER for the Chapter 8 Electrical Power. I'm the Project Manager Dennis Galvin and Amar Pal is our lead reviewer and he will proceed.

MR. PAL: My name is Amar Pal and I'm the NRO BEB. We met with you October 3, 2007. We did DCD Revision 3. We had the one open item on the battery sizing so we are going to discuss that, how you close this battery-sizing issue.

Furthermore, we are going to discuss the batteries, DPA's ancillary results and the conclusion because the batteries change from the DCD, the LVRA and now change to VLA. UPS also is changed slightly from the DCD Revision 3. I'm going to discuss that later and ancillary diesel generators later on.   The one open item related to the SER was RAI 8.3-52 involved in sizing of the battery. It did not provide the battery load profile of the sizing of the battery.

Finally we had an audit in 2008 and we were convinced that the procedure that is in the IEEE 485, especially the rating factor of 1.25 temperature correction factor based on lowest electrolyte temperature of 60 degrees, the design margin, and the uncertainty of the flow margin and the state of charge after 24 hours.

Also the appetency of the EPA factor of the EPS. I am convinced that the approach is right and it's going to provide the expected results.   RAI 8.3-52 is closed. There are two batteries, 6,000 volts. A total of two 40 cells and the charger is 500. As we said, batteries changed from VRLA to VLA in the DCD Revision 6.

The VLA has more experience in industry and in the nuclear power plants. Batteries are adequately sized to mitigate accident without charger support for 72 hours. Battery qualification will be demonstrated by type testing per licensing topical report NEDE-33516P.

All the safety-related loads are provided by the UPS. UPS consists of a rectifier and an invertor. Each division has two UPSs and each UPS normally carry 50 percent of the load. Normal power to UPS is 480 volt from isolation power center (IPC) bus and standby power is 250 volt dc from batteries.

We are concerned about the impact of the high voltage transients during islanding mode of operation in RAI 8.2-14. That has been discussed so I'm going to skip that.

We assisted on the ITAAC to verify the trip coordination of safety-related battery chargers and UPS input rectifiers with inverters. As a result of that, the same concern. ESBWR design has been changed to eliminate the safety-related UPS bypass transformers because of potential for disruptive voltages and frequencies to reach safety-related loads. RAI 8.2-14 was resolved.

Ancillary diesel generators added in DCD Revision 4. Two ADGs provide 480 vol ac power to meet post 72-hour power requirements. They are seismic Category II and building seismic Category II. They are not required to support safety-related loads for the first 72 hours following the loss of all other ac power sources. An undervoltage condition on ancillary diesel buses or a low ancillary diesel room temperature will start ADG.

The ADGs are part of RTNSS program. The Availability Control Manual requires that two ADGs with fuel tanks, fuel oil transfer pumps and ancillary buses be available during all modes of operation. ADGs are started and operated at rated load for one hour every 92 days. ADGS are load tested at rated load for 24 hours every refueling outage. That gives us some assurance that the ADG will be performing functionally when required.

Conclusion: The applicant has provided sufficient information to demonstrate that the offsite power supply system, onsite ac power supply systems, and onsite dc power supply systems are capable of providing power to support the plant's safe operation satisfying the requirements of GDC 17 and 18. Additionally, the staff concludes that the ESBWR design is in compliance with 10 CF 50.63 as they relate to the capability to achieve and maintain hot shutdown in the event of an SBO.7.

That concludes my presentation if you have any questions.

MEMBER STETKAR: I do.

CHAIR CORRADINI: John.

MEMBER STETKAR: One section in the LCR addresses specific generic letters and they are generic letters and they are generic letters 84015, 88015, and 94001. They are related to basic design and testing requirements for emergency diesel generations.

My conclusion is that the applicant doesn't need to comply with -- doesn't need to address, I guess, because they are generic letters -- doesn't need to address, I guess, because they are generic letters, doesn't need to address those generic letters because the design doesn't contain any emergency diesel generators.

It does not obviously contain diesel generations, both the standby diesel generators and the ancillary where they are not safety related but they are designated as RTNSS equipment so they are important to safety. I was curious why just because something is not called a safety-related emergency diesel generator it doesn't necessary need to address these issues that apply to things that I would call a diesel generator.

MR. PAL: Yes. Staff looked at the way that these diesel generators are not required during an accident or shutdown of the plant. That is the main reason we said that the DCD function is not required.

CHAIR CORRADINI: Did that answer your question?

MEMBER STETKAR: You know, if I were an attorney I would understand that answer. If I'm an engineer I don't understand the answer because these diesels are important to safety. They are RTNSS equipment. They are not insignificant in terms of the overall plant.

CHAIR CORRADINI: So your point is because they are RTNSS they ought to be considered emergency --

MEMBER STETKAR: I'm trying to get my hands around -- we'll talk more about this this afternoon but I'm trying to get my hands around what it means to be RTNSS and what that classification means in terms of assuring the reliability -- the design, the reliability, and the availability of the equipment.

I have to admit I didn't go back and read these generic letters so I don't specifically know what issues are highlighted in them but if they apply to the design or the reliability of diesel generators, I'm trying to get my hands around why they are irrelevant.

MR. PAL: Well, as I said, they have the availability control and that requires them to do some testing every 92 days and then every refueling outage so that kind of gives you some assurance that these diesels will perform their function.

MS. CUBBAGE: I think there are two parts to this. One is what function is required when it's required and then you go into Reliability Assurance Program. They are required to make sure that the diesels are designed adequate to perform those functions in the times required. Again, we can get into that in more detail this afternoon.

MEMBER STETKAR: And maybe it's better to discuss it there. The reason that I brought it up is that, for example, GL 84015 is entitled Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability. I'm curious whether the reliability and availability programs proposed under the RTNSS treatment of these diesels basically satisfy the functional concerns of that generic letter.

MS. CUBBAGE: Well, unless Arm and Renaldo are prepared to address the specific details of that generic letter, we will try to look into it a little bit more and get with you this afternoon on those topics.

Do you have anything to add?

MR. JENKINS: This is Renaldo Jenkins. The generic letters that you are referring to reflect sort of a fast interaction with industry over time to reflect the concerns the staff had regarding the equipment meaning their specific safety related requirement. In particular there were requirements that the diesel would start within 10 seconds. That was tied to the Chapter 15 accident analysis. That was a driver for a lot of the reliability concerns.

Now, in RTNSS space you have the same concern regarding the reliability and availability but you don't have the strict technical requirements, let's say, of starting and loading within a specific time. To say that staff would not be interested in ensuring the reliability and availability of the equipment is not exactly true. We should reflect the concerns of the technical requirements embodied in those generic letters but did not --

MEMBER STETKAR: That's a good answer. I'm glad to hear that because I was just a bit concerned that in the SER these generic letters were essentially dismissed as irrelevant simply because these diesels don't have the safety related emergency stamp next to their name.

MR. JENKINS: Right. That is where the whole RTNSS program really needs to sort of capture that, the lessons learned over time regarding how we can assure reliability but not have a strict written requirement.

MEMBER STETKAR: Okay. Thank you.

MS. CUBBAGE: And that thought process went into the staff's determination of applicability of these generic letters, although I --

MEMBER STETKAR: I would feel a lot more comfortable if that paragraph was in the SER.

MS. CUBBAGE: I agree with you on that point. I think the statement that it's safety-related emergency diesel, that implication to us is the start time, etc.

MEMBER STETKAR: And I fully agree with that. It's the reliability availability part of the equation that I wanted to make sure was being picked up through the RTNSS program and that there wasn't anything in the RTNSS availability reliability program that was -- I wouldn't say contrary but substantially relaxed from issues that have been identified in those generic letters. I understand the start time. That is clearly a separate issue.

MS. CUBBAGE: And just to follow a little bit, that particular generic letter the focus was on station blackout and the batteries, of course, are the line of defense on the ESBWR for safety-related protection on Station Blackout.

CHAIR CORRADINI: Do you have --

MEMBER STETKAR: No. We'll wait.

CHAIR CORRADINI: Okay. Other questions by the committee? Thank you.

I think this might be a good time to take a break.

MS. CUBBAGE: This would be a great time to take a break.

CHAIR CORRADINI: So you can assemble your troops.

MS. CUBBAGE: The Chapter 11 folks need to assemble since we are working ahead of schedule.

CHAIR CORRADINI: So we'll take a break. We are little bit ahead. We'll start at 10:30 in 15 minutes. Thank you.

(Whereupon, at 10:12 a.m. off the record until 10:31 a.m.)

CHAIR CORRADINI: Okay. Let's get started. I apologize for being late. I'm sorry.

Tim, you're up.

MR. ENFINGER: I'm Tim Enfinger, GEH Reg Affairs again. I would like to introduce Jim Cascone, the GEH Rad Waste Engineer for ESBWR. He is going to make our presentation for Chapter 11.

MR. CASCONE: Again, I'm Jim Cascone, GEH, Chapter 11 engineer. I just wanted to go very quickly through a brief timeline of Chapter 11. Initially Rev. 3 back in February 2007 in the chapter there were no P&IDs and all the systems were considered mobile and conceptual.

In Rev. 4, September 7, 2007, detailed P&IDs were included. However, the systems were still consider mobile and conceptual. The last ACRS meeting held in October 2007 was really based on Rev. 3, not Rev. 4. Then in Rev. 5 as a result of some supplements to RAIs, which we'll talk about in a bit, the P&IDs are obviously still there and the subsystems are now considered permanent and final, something that the staff can review.

From the SER in 2007 there were three open items, all of which have been resolved. The two more significant open items were RAIs 11.2-16, 11.4-18. We have the same issue. However, the 11.2 RAI was for liquid and the 11.4 is for solid waste. I'll talk about them a little bit more. The third RAI was 11.4-15 and the question was the staff wanted us to include ITACCs for the solid waste system and we did that. That items is resolved.

The two more significant RAIs, 11.2-16 and 11.4-18, specifically required us to make the systems permanent meaning take out mobile and to also make the designs final and remove the word conceptual.

Initially it was our intent to have the COL applicant specify the systems and staff said that they couldn't review something like that. They needed to have a final design so that is what we did. These sections that you see here, 11.2.2.2 and 11.2.2.3 and the figures the system process really did not change.

What we did is just reworked the words so that mobile was removed and anything that conveyed it to be a conceptual design was removed and we are committed to having these systems as the permanent systems so the staff can review it. Really there were no technical changes. We just went from a mobile conceptual design to a permanent more final design.

MEMBER ARMIJO: Does that mean it's in a building as opposed to a skid or something like that?

MR. CASCONE: Well, the systems themselves we'll talk about that in a little bit here. The actual process of systems will be skid mounted. Yes, they will be anchor-bolted down to the floor and they will have shielding. In fact, there will be some custom shielding.

When we actually spec it out in detail the shielding will be -- the plant will provide some mobile shielding and also the actual skids will have shielding. We are getting kind of ahead of ourselves. I'll answer here on another slide. The same thing is true for the solid waste system. We did the same thing, removed mobile and turned it from a conceptual to a final design.

Now, this is just a typical P&ID that we have added. All the P&IDs are in the Chapter 11. I understand it's tough to read and I didn't expect you to be able to read it. I just wanted to show the level of detail that we have in the chapter now.

It's significant.

I broke that previous slide up into the next three slides. This slide here shows the collection tanks. These tanks are located on the lower elevation of the radwaste building. These tanks are going to be required regardless of what kind of process we have. They are going to be down in concrete vaults. Like I said, regardless of the process, these tanks are required.

This slide here is the actual equipment drain process. It is identical to the floor drain process. It's going to be broken up into skids and this equipment here will be located on the grade level elevation of the radwaste building.

The grade level elevation of the building is going to be served by the radwaste crane so as the skids come off the truck we'll be able to place them and fix them down and either pipe them up, use hoses, it really hasn't been established yet, and then shield it up.

The reason we're going with this is 30 years into the life of the plant if someone comes up with a better idea it will be a relatively easy thing to do to pull these skids out and replace them with whatever the better idea is because, again, it's going to be on the level with the crane.

Most radwaste buildings to do something like that it is so difficult that it is essentially impossible to do. To do that in an existing radwaste building you would be chipping concrete and a lot of cutting pipe.

It would be a very difficult job. Most plants now that use systems, skid-mounted systems, what they have to do is shop around for real estate in order to be able to make use of the latest technology and we built that real estate right into the design.

MEMBER RYAN: On this level all of the equipment that we are looking at in this drawing is skid mounted?

MR. CASCONE: This drawing here is going to be skid mounted.

MEMBER RYAN: And how much work space is represented with this skid-mounted approach? Close to the building?

MR. CASCONE: It's a couple of areas of the -- there are going to be two areas on grade elevation, the 4650 elevation. I think we allocated like 50 by 150 feet per system. You've got to understand what you are seeing here can represent like three different skids.

MEMBER RYAN: I appreciate that you are saying that you want to have the ability to change systems out over a lifetime of a plant because radwaste does evolve over time. I'm trying to just get a feel for if 30 years from now I decided I needed a whole new set of skids how much floor space am I getting by removing all this?

MR. CASCONE: Like I said, I think we allocated 50 by 150 feet for these skids.

MEMBER RYAN: For all three?

MR. CASCONE: No, for each one.

MEMBER RYAN: For all three?

MR. CASCONE: All three. For just this subsystem we have a floor drain system that also has like 50 by 150 feet and that is skid-mounted. In fact, what we did here is both the equipment drain system and the floor drain system are identical processes so we have a certain degree of flexibility now. If one system is down we can pick up using the other system.

MEMBER RYAN: Okay. Thanks.

MR. CASCONE: Let's go back to the skid.

MEMBER STETKAR: Jim, the collection tanks, you said they are basically permanent.

MR. CASCONE: Yes, they are permanent.

MEMBER STETKAR: Are the cubicles for those tanks lined?

MR. CASCONE: Yes.

MEMBER STETKAR: Okay.

MEMBER RYAN: If there is a skid-mounted system problem, would it drain ultimately to these cubicles?

MR. CASCONE: All of these -- actually not to these tanks. They would be going to the floor drain. That level will have floor drains. Yes, absolutely.

MEMBER RYAN: Okay.

MR. CASCONE: Really, there is not going to be that big of a volume of water there so there is no collection tanks there.

Okay. We talked about collection tanks. We talked about processes on the last one. Here we've got these sample tanks again. Regardless of the type of process we are going to need these tanks. These are going to be the last tanks in the process and they are going to be, again, located on the lower elevation of the radwaste building. All the tank cubicles will be lined cubicles. This is the last step before it either gets sent back to the CST or discharged.

MEMBER RYAN: I guess the volume of the lined cubicle is enough for one tank?

MR. CASCONE: Yes, plus some more. We haven't established it yet but it's going to be more.

Let's look at the last one. This just summarizes what I just said. Collection and sample tanks are going to be located at lower elevations. We are going to use them regardless of the process. Then the processing equipment is going to be modular on grade elevation. It will permit us to switch systems in the event someone invents a better mousetrap in the future. Thanks. Any questions?

MEMBER STETKAR: Yes, a couple questions. The question has nothing to do with anything that you have just presented. The design mentions that the only tank outside of the radwaste building that might contain some level of activity is the Condensate Storage Tank and that is an outdoor tank. I understand it has a berm around it. It has a collection size and things like that. Do the lines that communicate with the Condensate Storage Tank are they routed underground? Do they bury piping?

MR. CASCONE: There will be some, yes.

MEMBER STETKAR: What provisions are in place for --

MR. CASCONE: For the piping going through that building there was a subsequent RAI that we addressed. Those lines will be doubled-walled.

MEMBER STETKAR: Double-walled?

MR. CASCONE: Yes.

MEMBER STETKAR: Is there a leakage monitoring between the walls or simply a double wall?

MR. CASCONE: It was simple a double wall. We have not designed a leakage monitoring but the pipes will be double-walled.

MEMBER RYAN: How long a run is it?

MR. CASCONE: Well, it's not that long. I don't know if I can quote footage but from the turbine building to the CST it's not that long.

MEMBER RYAN: Not a 1,000 feet?

MR. CASCONE: Not a 1,000 feet.

MEMBER RYAN: But more than 100 feet?

MR. CASCONE: Probably less than 100 feet.

MEMBER RYAN: Less than 100 feet. I guess over the long haul if you think of things like lots of heavyweight traffic over it.

MR. CASCONE: There won't be any of that

coming over it. It will be between the turbine building and the CST.

MEMBER RYAN: Have you picked any materials for this pipe yet?

MR. CASCONE: Haven't even selected them.

MEMBER RYAN: I guess the whole leakage issue, you know, I'm thinking keep it simple. If you're inside the turb looking up, you'll be able to see the pipe going through and then and annulus around that so it's something that would be relatively visible to an operator on a tour so we haven't really designed anything there yet.

MEMBER STETKAR: Jim, if you don't have any in situ monitoring for leakage, you know, leakage monitoring between the double walls or whatever, where are your groundwater monitoring wells located on the site? Are they out on the fence line or our they in close --

MR. CASCONE: I can't answer that. It's probably something that is site specific.

MEMBER STETKAR: That would be in the COL. Okay.

MR. CASCONE: That's not something I can answer.

MEMBER STETKAR: Okay. Fair enough.

MEMBER RYAN: There is an interesting and I think important point here is that there has got to be some interaction between surface water, near-surface groundwater, and hopefully not the contents of the pipe. Whatever system you have and whatever the arrangement is, of course, it's going to vary from plant to plant, it's an important question to address.

Obviously it's been in the news and has been paid a lot of attention. Double-wall pipes are great stuff but, then again, how do you verify it over 30, 40, 50, 60 years of operation. Something to think about.

CHAIR CORRADINI: Other questions, John?

MEMBER STETKAR: Yeah, and I'm not sure whether this is fair game but I guess we'll ask it anyway.

CHAIR CORRADINI: We can always declare you outside the box. Go ahead.

MEMBER STETKAR: You don't need to declare me outside the box.

CHAIR CORRADINI: Legally.

MEMBER STETKAR: You can put me in the box or whatever. Anyway, apparently the onsite storage capacity, I'm talking about low-level waste storage, has a nominal capacity for about six months. You correctly say that storage capacity is a nominal storage capacity and it's a specific COL items as far as agreements for disposal of that waste. Do you have any estimates based on -- actually Dr. Ryan might know this -- based on our current operating fleet whether six months storage capacity is adequate?

CHAIR CORRADINI: Dr. Ryan.

MEMBER STETKAR: I'll ask GEH or Dr. Ryan who might --

MR. CASCONE: I can tell you right now for most of the plants the answer to that would be no because Barnwell has shut down so right now there isn't a place to ship to so they are going to have to store it until they can find a place to ship it to.

MEMBER RYAN: Capacity is not the question. It's access to capacity.

MEMBER STETKAR: Well, no. But, I mean, in terms of onsite storage capacity if I were going to build an ESBWR today, I would probably be looking for more onsite storage capacity.

MR. CASCONE: It depends on what state you're building it in. Most of the states, like I think 36 or 37, were shipping to Barnwell so to answer yes --

MEMBER STETKAR: Trying to get a feel for that in terms of the practicalities of putting one here in the U.S. Okay, thanks.

MEMBER RYAN: And I appreciate the fact that's a question you really have to think about it as things evolve and they are evolving all the time. Just for everybody's benefit, Texas is in the process of getting a license and Barnwell is closed. All but the Atlantic Compact states and the current facilities in the Atlantic Compact states as opposed to new ones and --

CHAIR CORRADINI: But that's a small subset of who used to use it.

MEMBER RYAN: Oh, absolutely. EnviroCare is available for some class A waste. As far as utilities go, I mean, some class A waste could go to --

MR. CASCONE: To the Utah facility.

MEMBER RYAN: -- Utah. But, you know, at this point the whole question of blending is still out there being assessed now.

MEMBER STETKAR: It was just a point of -- I was just trying to get a feel.

MEMBER RYAN: Thank you very much.

MR. CASCONE: Any other questions?

CHAIR CORRADINI: I think we're done.

MR. CASCONE: Thank you very much.

CHAIR CORRADINI: David, are you going to lead us off?

MR. MISENHIMER: Yes. My name is Dave Misenhimer. I'm the Chapter PM for Chapter 11. It's only been recent that happened but, nonetheless, I'm here as the Chapter PM. George Cicogtte is our technical reviewer who is going to do the presentation today. He is going to focus on the few open items.

CHAIR CORRADINI: We're just helping you out.

MEMBER STETKAR: When you come to subcommittee meetings you've got to learn to operate the equipment. This is sort of the low budget part of the operation.

MR. MISENHIMER: I should have had that set up first. Sorry about that. So, anyway, I'll let George take it from here.

MR. CICOTTE: Are you going to operate the slide thing? Okay.

We are here to talk about what is being done about the open items that were resolved and closed since the last time this came before the committee and hopefully we can answer any questions that you have about those items and anything else that has been changed since then.

Just a brief overview on that last slide, I guess. Like Mr. Misenhimer I was not on the original review but I have gone over that since I was assigned to this.

CHAIR CORRADINI: Speak up a little bit.

MR. CICOTTE: I was not originally assigned to this particular design but took that over from Jean-Claude Dehmel. That's why I'm here to take care of this. There have been some things that we went over to make sure we had all our ducks in a row.

The remaining open item for Chapter 11 was 121.2-16, as the applicant had indicated. Our presentation is basically we had the same information because we were looking at the same things, what they had provided in the initial description and such, and we asked them some more information about it. They provided more information and ultimately it was decided that they would change these from the mobile systems to the permanent systems.

I know you were asking about the fact that these are skid-mounted and such. As far as what we looked at, although these systems are skid-mounted, you are talking how much room there is for them and such, one of the things that we look at is whether or not the capacity of the building for them is adequate, whether the systems fit in the room, whether it can be shielded, that any leakage inside be properly collected and ventilated and filtered and that sort of thing.

We ultimately decided this was sufficient. As far as the safety evaluation goes, whether it's skid-mounted or not doesn't really affect that because it's still designed to be monitored for leakage.

MEMBER RYAN: Sometimes maintenance activities, you know, having the ability to take a skid off and out into a different area sometimes buys you a lot from an ALARA standpoint as opposed to a welded firmly-fixed --

MR. CICOTTE: From my former life as an HP technician many years ago in a number of power plants, in particular some BWRs, the existing plants a lot of times they will bring in skid-mounted systems and such to augment the capacity for a particular function and such.

As I mentioned, sometimes there are some real estate problems but in this case it's my understanding from what the applicant was talking about and the representation they made to us are the purpose here would be to supplant those systems, not to provide additional skids inside the area but take those out in modular form. As you pointed out, there are some ALARA advantages to going in and cutting and such.

I worked on the piping replacement at Peach Bottom and that was very labor-intensive so there are some distinct advantages there. But these systems are designed to pull out and put a new one in. If they made design changes, those would be addressed in the operating side.

11.4-18, as they pointed out, pretty much the same thing. It was just that these were solid waste processing systems and that's pretty much the same thing so that was all we had about that.

In part because of the fact that they were changing to permanent systems and in part the way that the systems were being described we had asked them to take care of the problem, whether it's a mobile system or permanent system and the effect on what should be ITAAC. That's really what 11.4-15 was about. There aren't any open items remaining in either 11.2 or 11.4.

Any questions for me?

MEMBER STETKAR: Yes, George. I hate to hit both you guys with this given your history but it's something I apparently didn't pick up the first time. I wanted a little bit of clarification and maybe GEH can help out. This was with gaseous waste, something we really haven't discussed this morning.

There's an analysis performed. Apparently Branch Technical Position 11-5 includes -- again, it's a Branch Technical Position so I don't know whether I should characterize it as a requirement to show that you meet doses at the exclusionary boundary for release duration of two hours from a leak or bypass event in a gaseous waste processing system.

GEH has calculated the doses based on a one-hour release rather than a two-hour release. The SER has accepted that based on the fact that the release duration of one hour is classified as being consistent with the isolation time for the system.

The analysis that they have performed says the system has to be manually isolated so there is no automatic isolation of the system.

I was curious whether the guidelines under the Branch Technical Position it's okay to take credit for manual isolation of those releases or whether or not a release then, indeed, extends for two hours would still meet the dose requirements. My suspicion is that it wouldn't because otherwise why would they reduce the isolation time.

MR. CICOTTE: I believe the premise under which it was approved was that the one-hour time frame -- the two hours was basically kind of a default value in the Branch Technical Position absent additional information. The information that was provided by the applicant in support of having it be one hour was sufficient to conclude that it was not likely that it would last that long, that isolation would be able to be accomplished such that a one-hour duration would be an outside window.

Part of their analysis says that the cause of this failure could be, I think they use the term, computer related but I'll substitute digital I&C control system related where the operations might not necessarily have all of the indications available to them that they do under normal situations.

MEMBER STETKAR: I guess what I'm asking

is I'm focusing on the fact this is a manual action. Granted one hour is not 10 minutes but whether or not that type of manual isolation is consistent with the staff's interpretation of the guidance.

MR. CICOTTE: I'll have to look that up to be certain.

MEMBER STETKAR: Again, I have to apologize. I didn't pick it up the first time around as those reading this, "Oh, that's kind of interesting."

MR. DEHMEL: Yes, Jean-Claude Dehmel. Yes, it was accepted that the manual isolation option was accepted as being essentially suitable way of terminating this postulated accident

MEMBER STETKAR: Okay. Thanks.

CHAIR CORRADINI: Other questions? Thank you very much. I think we're running ahead but I would like to continue and start Chapter 17 if we could from GEH before lunch.

MR. MISENHIMER: And then we can follow after.

CHAIR CORRADINI: Well, it depends. Let's see how it goes.

MS. CUBBAGE: I have already contacted Todd and he's on his way.

CHAIR CORRADINI: Amy is organized.

MS. CUBBAGE: Right. We are going to do our best to pull everything forward to the extent that staff are available and reachable.

CHAIR CORRADINI: And if they're not, we'll just break early for lunch.

MS. CUBBAGE: Great. Thank you.

CHAIR CORRADINI: Thank you very much.

The next team is up.

MR. DOUGHERTY: I'm Lee Dougherty with GEH Licensing. I'm going to talk about Chapter 17. 17.1 through 3 didn't have any open issues so Gary Miller is going to talk about 17.4, the Reliability Assurance Program.

MR. MILLER: Good morning. I'm Gary Miller. I'm the technical lead for PRA for the ESBWR. As Lee said, I will talk through the open item on Section 17.4. There was one item from the 2007 SER with open items. It was a request for GEH to provide a list of structure systems and components or, as we say, SSCs, within the scope of the Design for Liability Assurance Program.

The open items itself was basically GEH at that point in time said they would provide a list of risk significant components at a later point in time due to the early development of the PRA itself. This request was actually to provide the list at this phase of the Design Reliability Assurance Program.

What I'm going to talk about now is the SSCs that are in the scope of the design phase of the Reliability Assurance Program for the ESBWR and it consist of two major elements and a little bit of overlap but the items that are in the D-RAP are all of the RTNSS structure systems and components so those will be carried on.

As well as that there are the risk-significant structure systems and components that were identified in a separate report and that is our NEDO-33411 report and Rev. 2 of that which reflects Rev. 5 of our PRA has been submitted to the NRC to satisfy the request.

As I said, the written SSCs, the one portion of it, and that is addressed in DCD Appendix 19A and the SER Chapter 22 which we will discuss this afternoon. The remaining portion is the risk-significant SSCs and I would like to walk through a bit of the methodology to give you a background on that.

To identify risk significant components

that would go into the Reliability Assurance Program which would then in the operations phase go into the maintenance rule, we started with a risk ranking similar to what you do in the maintenance rule. The criteria that we used to start off with were for our basic events.

Anything with a Fussell-Vesely ranking of greater than .01, greater than or equal to, and a Risk Achievement Worth of greater than or equal to five for individual components or greater than or equal to 50 for common cause failures. That was one of the criteria that we used.

MEMBER STETKAR: Gary, let's stop you there. This is going to be telegraphing to the staff, perhaps more a question for them than you. Let me characterize it as the normal screening criteria that are used for determining risk significance or Fussell-Vesely importance greater than .005, essentially half the value that you have used, and a Risk Achievement Worth greater than 2, a value of whatever two-fifths is, 40 percent of what you've used.

MEMBER STETKAR: I believe it's greater than 20 for common-cause failures, Risk Achievement Worth. How do you justify using values that are substantially higher than what I'm characterizing for the moment as the normal values because the application of these values obviously would reduce the number of components in your D-RAP list compared to those other criteria.

MR. MILLER: Okay. That's a fair question. Those criteria are discussed in Reg Guide 1.174 along with a lot of other industry information.

MEMBER STETKAR: I don't think those are in 1.174.

MR. MILLER: Okay, risk ranking is discussed.

MEMBER STETKAR: Risk ranking is in 1.174.

MR. MILLER: Okay. Those were derived when we developed the maintenance rule in CRF 50-65. Those guidelines were based at the time on the nuclear plants who typically had a core damage frequency between 10 to the minus per year, 10 to the minus 6 per year. Given that they judge that represented a reasonable risk ranking that would capture the risk insights for the current plants.

When we applied those criteria as well as the other criteria such as any cutset within the top 95 percent of the core damage frequency the problem we ran into was that our core damage frequency, as you know, is two orders of magnitude lower than that so we found that the population of risk ranking that made it above the criteria was exceptionally large and from a reasonableness standpoint a lot of components that should have no risk significance at all were making it into there. So, as I said, we looked at Reg Guide 1.174 which stated that the risk ranking criteria they should be related to core damage frequency and the large release frequency and not necessarily be static numbers like that. We used that to go back and create new criteria as you see there.

What we did we looked at changes in risk that would give us a change of greater than about one times 10 to the minus seven per year so that would seem to get us -- that is still an order of magnitude less than what is considered significant in Reg Guide 174 but that allowed us uncertainty. We conservatively chose 1E-7 per year. We looked at Fussell-Vesely values and Risk Achievement Worth values.

CHAIR CORRADINI: So can I just -- since this is not an area that I understand, I just want to understand your thinking process. So you're saying you came back to these numbers because they corresponded to a change in the delta-CDF of one times 10 to the minus seven? Is that how I understand what you're saying?

MR. MILLER: Yes, that would be -- right.

CHAIR CORRADINI: These were tuned to give you that result.

MR. MILLER: Yes, a little bit. It was more of a shift to gauge it at 1E-7 per year. That's right.

CONSULTANT KRESS: That's each component?

MR. MILLER: Yes.

CONSULTANT KRESS: How many components did you end up with?

MR. MILLER: In the risk significant components?

CONSULTANT KRESS: Yes.

MR. MILLER: Give.

CONSULTANT KRESS: We usually end up with hundreds.

MR. MILLER: It's not hundreds.

CONSULTANT KRESS: It's not hundreds?

MR. MILLER: It's not hundreds.

CONSULTANT KRESS: I'm trying to modify

the one times 10 to the minus seven by the number.

MR. MILLER: I don't know. I couldn't tell you. I would have to look it up as to how many components are risk significant.

MEMBER STETKAR: A couple follow-on comments or questions. I suspect you are aware that the staff is currently working on efforts to examine, let's say, risk metrics for the new reactors such that it is not at all clear how the specific numerical values in Reg Guide 1.174 may apply for some of the new reactor designs.

MR. MILLER: Right.

MEMBER STETKAR: You have to be a little bit careful about referring to 1.174 as a reference.

MR. MILLER: Okay.

MEMBER STETKAR: That's just a comment. How would you respond if I noted that all of the other design centers that are proposing new reactor certified designs are using the criteria that I characterized as the normal criteria you being the outlier?

MR. MILLER: I stand by our analysis.

MEMBER STETKAR: That part of the question is going to be more for the staff.

CHAIR CORRADINI: I understand. You're

just giving me my heads up.

MEMBER STETKAR: That's right.

CHAIR CORRADINI: Proceed.

MR. WACHOWIAK: This is Rick Wachowiak. I participated in the meeting that the staff had a couple weeks back on the risk metrics.

CHAIR CORRADINI: Speak a little louder into the bulb, please.

MR. WACHOWIAK: Rick Wachowiak. I was at the meeting and the discussion seems to be moving away from numeric metrics and addressing it in a more defense-in-depth manner. That's the way the staff seems to be moving on that. Reg Guide 1.174 is what we have today so that is what we choose to use.

MEMBER STETKAR: There is one issue that we run into with these risk metrics that were developed for plants with totally different risk profiles. If you can go into -- there is a thought experiment that I have. Let's say you have a plant that has, let's say, four different safety components.

Each component has a failure rate of 10 to the minus three and each one can completely mitigate any accident. Essentially you have a 10 to the minus 12 CDF. With one cutset it has all four of those components. Every one of them has a Risk Achievement Worth of 1,000 and every one of them has a Fussell-Vesely of one. But are all four of them risk significant?

You can explain that out to any number, six, 12, whatever on down the line. With ESBRW one of the things that we tried to do was have a balanced risk profile so that each system is essentially the same level of importance and the number of systems that you would have to fail, the number of components you would have to fail tend to be low.

It's not that exact example but intent was for that example. So what we were trying to look for is a way to take the importance measures that were developed for a completely different risk profile and try to apply it to this plant. The method that we chose was one that was there. Using the 10 to the minus seven value seemed reasonable as it was an order of magnitude below what the Reg Guide says.

Then the other issue about the outlier is that the other plants have risk profiles that are closer to what the existing fleet has and so that would be the majority of the justification there.

MEMBER SHACK: Of course, you used it for the ABWR, too.

MR. WACHOWIAK: Which is closer to the existing fleet at two times 10 to the minus seven.

MEMBER STETKAR: You have to be careful that the ABWR DCD does not specify this. The current ABWR COL FSAR application --

MEMBER SHACK: No, the ABWR DCD does.

MEMBER STETKAR: Couldn't find it anywhere.

MEMBER SHACK: They don't say RAW out loud. They say Risk Achievement Worth

MEMBER STETKAR: I know it does in the current COL.

MR. WACHOWIAK: We struggled with this trying to figure out what is the right measure.

MEMBER STETKAR: It is a struggle and I don't want to go into the philosophical discussion of where the risk metrics are going. It's an open issue right now with the staff. There is not closure on that. However, again it is more important for the staff so perhaps we ought to delay this discussion until the staff comes up.

If a piece of equipment on Plant X can double the risk if it's failed and that determination is adequate for that plant to say, "This is important to me," that same piece of equipment if it doubles the risk on the ESBWR is not important to you. That is the concern. That's the concern.

As I said, it's more of a discussion for the staff in terms of consistency in what we feel is important or not important across the fleet during the certification process rather than the absolute criteria that you've used whether it's 10 to the minus seven or 10 to the minus two, or 10 to the minus 30 for that matter.

MR. MILLER: Right. I understand.

MEMBER STETKAR: I just wanted to kind of get your feedback on some of the rationale for the numbers that were used.

MEMBER ABDEL-KHALIK: Could you give us an idea about the change in the number of components in going from two to five? You offered that as the justification for this.

MR. MILLER: I don't have the statistics on it but what we found was there were a lot of support systems, maybe turbine component cooling water, things from a practical standpoint would not be risk significant with what you find in a typical plant. It got into supporting systems for perhaps HVAC in some areas.

MEMBER ABDEL-KHALIK: Is that statistic available somewhere that you can just give us an idea what that number is?

MR. MILLER: I think we can generate that, the difference between --

MEMBER ABDEL-KHALIK: A RAW of two versus five.

MR. MILLER: Five, yes. We can provide that information.

MEMBER STETKAR: Gary, were you going to discuss anything -- no you're not -- anything about NEDO-33411? I was curious since that is essentially the documentation for both the process and the list of equipment in D-RAP.

MR. MILLER: Right.

MEMBER STETKAR: I would like to ask you a little bit about that.

MR. MILLER: Well, the remaining bullets are all --

MEMBER STETKAR: Okay. Let's go through that.

MR. MILLER: Okay. All right. The remaining bullets, as I said, have to do with the different elements that we used to determine the risk significance. It was both probabilistic and a bit deterministic. The first one we talked about were the risk rankings.

The second one we looked at was the Seismic Margins Assessment that was performed. Any equipment that required a HCLPF or High-Confidence, Low Probability of Failure could withstand a safe shutdown earthquake, those items are listed in DCD 19.

MEMBER STETKAR: It's too warm in here it goes off.

MR. MILLER: Okay. Those were included in scope as risk significant. We also added all RTNSS SSCs meaning the Criteria C and D and that was SSCs relied upon to meet the NRC safety goals as well as those relied upon to meet the containment-performance goals so those were included as risk significant.

Then we wrapped it up with an expert review process where we looked at operating experience review and insights from the PRA itself, the severe accident insights, and then an integrated perspective of all that information, sort of an overview type review to make sure that other things were considered on our list. That's a very high-level overview of 33411.

CHAIR CORRADINI: I'm waiting for your response, please.

MEMBER STETKAR: Yes. Is 33411 the complete documentation of that process?

MR. MILLER: Yes. It does not contain the --

MEMBER STETKAR: Let me ask, I read through that and I looked at the list of equipment and I don't know the plant well enough to look at individual components and failure modes in every last system in the plant so I started thinking about a couple of systems that I at least know a little bit about.

For example, the balance of plant-chilled water system and the turbine component cooling water system are not listed in the D-RAP list. Okay, there must be some basis for that. The basis can't be the PRA because those systems are not modeled in the PRA so their importance is precisely zero and the risk achievement worth is precisely zero because they are not in there.

So that means that the expert panel must have thought about those systems carefully and made a determination about why they are not on the list. I was curious where that deliberation and determination is documented because it's certainly not addressed in NEDO-33411.

MR. MILLER: Okay.

MEMBER STETKAR: I mean, there might be other systems but those are two that come to my mind and they are relatively extensive support systems that don't obviously cool any safety-related equipment but, for example, they do provide cooling for pretty much everything out in the turbine building --

MR. MILLER: Right.

MEMBER STETKAR: -- which could have some risk significance but I'm not sure. It's not something I can push a button in the PRA and generate a number because they are not in the PRA. They are just not modeled in the PRA.

MR. MILLER: We do some modeling of DCCWS in supporting --

MEMBER STETKAR: I couldn't find a basic event for it. Rick might help out but I couldn't find one.

MR. MILLER: I know we do.

MEMBER STETKAR: There is some justification that failures of TCCS as a contributor to initiating events are somehow rolled into the loss of feedwater initiating event frequency which is a generic loss of feedwater initiating event frequency that may be derived from plants that don't have DCCWSs but I couldn't find a basic event even for DCCWS in any of the fault trees. I might have missed it. There are a lot of fault trees.

MR. WACHOWIAK: You looked in the fault trees, not in the list of cutsets?

MEMBER STETKAR: I looked in the fault trees. I mean, I looked at feedwater. I looked at where the usual suspects would be. I might have missed it. There's a lot of pages of fault trees there and it's pretty hard on a PDF file with a word search.

My two concerns relative to this is, No. 1, the PRA certainly does not include every system in the plant. It never does. It never does. The expert panel -- the purpose of the expert panel is to think about both the results that are visible from the PRA and see whether something that perhaps was below the numerical criterion established might be elevated to substantial importance due to either deterministic considerations, qualitative considerations, engineering judgment. Make the call that it is judged to be important enough that it gets elevated to be included on the D-RAP list for other considerations.

He points to the expert panel also as to think about the things that are not in the PRA to see if they are in there. I mean, a good example, indeed, is the lower drywell equipment hatch that the people thought about and said, "Okay, we're going to put it on but certainly not in the PRA."

My concern is how was the expert panel educated about what is and is not in the PRA other than looking at cutsets because obviously if it's in a cutset it's there. If it's not in a cutset, you don't know about it. Where is that expert panel deliberation documented such that I can see, "Oh, yeah. The expert panel indeed thought about this system and dismissed it for the following reasons," rather than, "Yes, indeed, they thought about that drywell hatch and included it." There is a paragraph about that in that NEDO.

MR. MILLER: But what you find in the NEDO is that what we included we discussed the things that we did include. We did not discuss the things that we considered and excluded.

MEMBER STETKAR: And excluded. The basis for that, that's what I'm missing in the NEDO and that's why I asked you as a lead-in is the NEDO the full documentation of that process or is there a separate expert panel deliberation report or something.

MR. MILLER: There is no formal report on that. Again, I believe there was PRA input to the panel. In the case of TCCW we did talk about what was in the PRA as well as the design which had a lot of redundancy and I believe three trains and things like that. Those things went into the thought process.

MEMBER STETKAR: It would be nice to see that thought process and have it documented for posterity. The problem is that once things are not included in the list they hardly ever make it onto a list later on if there are other insights that come out because you could say, "All of those really smart people did all of these really good analyses in the design certification and, in fact, the D-RAP list is part of the certified design documentation so there is a lot of incentive not to add things to that list later on.

MS. CUBBAGE: When the staff is up we can describe the RAI. There were a number of RAI's that were asked along the lines that you are talking about.

MEMBER SHACK: Just in general, I mean, your expert panel seemed to add very little to the list compared to the experience that one typically has in these lists where the expert panel adds substantially to the list. I mean, I see two items. Either you've got an extraordinary complete PRA or somehow your criteria seem to be a little different than other people.

MEMBER STETKAR: Well, the concern is the expert panel. Granted you have the representative from the PRA team on the expert panel. I don't know who that was but in many cases if the experts on the panel are not PRA practitioners or intimately familiar with the PRA, the presumption is that the PRA is complete and, therefore, if something doesn't show up as important in the PRA this is relatively high reliance on the PRA and those numerical metrics and the cutsets to give one confidence that you don't need to concern yourself with that.

Sometimes it's difficult for PRA people to actually explicitly say this is not modeled in the PRA so you experts should kind of think about this. In many cases PRA people because they justify the scope and the results of the PRA for a variety of reasons will say, "Well, yeah, it might not be modeled explicitly but we feel that we have captured it somehow. That is a different thing if I'm just a straight engineer.

MR. WACHOWIAK: This is Rick Wachowak. I think what we might be getting into here is a mixture of maintenance rule and D-RAP. Maintenance rule you end up pulling in a lot of those things from the expert panel because the purpose of the maintenance rule is to ensure that the total equipment is maintained appropriately.

The D-RAP, the purpose of the D-RAP is to ensure that the reliability of the components in the plant don't degrade below what was put into the initial PRA. That is the purpose of the D-RAP as stated there.

If you look at that population the things that aren't modeled in the PRA can't necessarily degrade to the point where they affect the PRA unless it's the passive things and the structures and things like that. It is more PRA centric than the maintenance rule is. The maintenance rule is covered under a different section which is a COL-Applicant section and it needs to be done under maintenance rule guidance. The D-RAP is used as input to that expert panel, not the totality of that expert panel.

The other thing that is in the ESBWR Section 17 which may not be in some of the other design centers is that we have a commitment for the COL holder. Once their post-construction PRA is complete they have to go back and revalidate the D-RAP list. That is also listed in our DCD. I don't think that's listed in with some of the other DCDs

MEMBER STETKAR: I think it might be.

MR. WACHOWIAK: The intent there is to go back and make sure that things like when you add a more detailed HRA after the DAC has been completed did that do anything to change your D-RAP list. We wanted to make sure that resolving those things during construction weren't missed.

To answer your question, it really is more PRA centric because the purpose of the D-RAP is to make sure that the components that are modeled in the PRA maintain the reliability and availability that was used in the PRA.

MEMBER STETKAR: I don't want to drag this too far on.

CHAIR CORRADINI: Well --

MEMBER STETKAR: Let me just for now say it is not modeled in the PRA, which my contention

TCCW is not modeled in the PRA. If I can't find a basic event for it, it's not there. By implication that piece of equipment is perfect. It can never fail because if it does fail it would make the PRA results worse. It might be a small numerical contributor but, indeed, it would make risk go up. It would not make risk go down. Right now its availability is 1.0. It's failure rate is 0.0 in the PRA so if the D-RAP list is going to --

MR. WACHOWIAK: The consequence is 0.0.

COURT REPORTER: Can you say that into the mic, please? I didn't catch it.

MR. WACHOWIAK: The consequence is 0.0 so, yeah, it could very well be that it has no impact. You're probably right that it might have some impact but the way it's treated is the consequence of that failure has no impact on the PRA. Therefore, it doesn't --

MEMBER STETKAR: It's assumed that it has no impact it's not modeled.

MR. WACHOWIAK: That's correct.

MEMBER STETKAR: And that's the whole point of having the expert panel to say, "Okay, it's not modeled in the PRA. We have assumed that it has no consequences. Expert panel, do you agree with that based on looking at the cooling loads, looking at what it supports, and a variety of things that perhaps are not captured explicitly in the PRA.

MR. MILLER: Including operating experience.

MEMBER STETKAR: Including operating experience, including --

MR. MILLER: Including redundancy in design, yes.

MEMBER STETKAR: What all goes into that process. I would have been quite happy, to be honest with you, if I saw the fact that, indeed, at a certain point the expert panel considered TCCW and recognized the fact that it was not modeled in the PRA, made a determination that it does not belong on a D-RAP list for the following reasons..... At least it's documented and justified. One could argue with the justification at that point but at least it's there for someone to examine.

MS. CUBBAGE: I would also just like to offer that the RTNSS process does a thorough evaluation of nonsafety systems, structures, and components. Anything that ends up in RTNSS ends up in D-RAP by default.

MEMBER STETKAR: Okay. Amy, I would

reverse it that certainly the D-RAP list if I use the PRA will absolutely identify everything that is on the RTNSS list. However, if something is not in the PRA -- D-RAP and RTNSS to me is the same topic. It's just simply a different licensing issue.

MS. CUBBAGE: But there are deterministic mechanisms that yield RTNSS system structures and components and they all end up in RAP regardless of what the PRA says.

MEMBER STETKAR: Okay. Well, I don't honestly believe that the TCCW system would rise to the level of risk significance that it would be considered a RTNSS system.

MS. CUBBAGE: Right.

MEMBER STETKAR: I'm not arguing with your absolutes.

CHAIR CORRADINI: But you think it should be part of it.

MEMBER STETKAR: I'm not making a judgment. This is not my design. I am questioning the process that was used to determine what SSCs that are not explicitly modeled in the PRA are either included or excluded from the D-RAP list and the basis for that inclusion or exclusion. That's basically what I'm asking about. If something were important enough to then trip over the more risk significant criteria for RTNSS, then I would be talking about RTNSS. Right now because this is Chapter 17 I'm only talking about D-RAP.

CHAIR CORRADINI: Do you want to carry this on with the staff in front of you or do you have more for this?

MEMBER STETKAR: I don't have anything more. No.

CHAIR CORRADINI: Let's bring the staff up and continue this discussion.

MR. MISENHIMER: Once again my name is Misenhimer. I'm here again. I'll be here for the rest of the afternoon for the other chapters as well.

CHAIR CORRADINI: Okay.

MR. MISENHIMER: Our lead technical reviewer is Todd Hilsmeier. He's going to focus on Section 17.4 where there were open items with respect to several RAIs. Basically Section 17.4 deals with the reliability assurance programs during the design phase. I'll let Todd take it from here.

MR. HILSMEIER: Thank you, David. Do you want to know my background before I start?

CHAIR CORRADINI: We trust that you're bona fide.

MR. HILSMEIER: Okay. Thank you. This presentation will discuss the staff's review of the list of SSCs within the scope of the reliability assurance programs for the ESBWR.

As a little background information in October of 2007 the staff presented the subcommittee its review of Chapter 17, the ESBWR DCD on quality assurance and the staff identified one open item whereby the applicant identified the SSCs within the scope of RAP.

In May 2008 the applicant provided NRC with a list of RAP SSCs for review. For ACRS' letter in November 2007 the staff is presenting today through the subcommittee results of our review of the list of RAP SSCs.

The RAP SSCs within the Design Certification envelope includes both all RTNSS SSCs identified under DCD Section 19A which was reviewed as part of DCD Chapter 19. Also within the scope of RAP the additional SSCs identified under Licensing Topical Report NEDO-33411. The review of this report will be discussed in the next slide.

Because these RAP SSCs are within the design certification envelope, the DC applicant specified a COL information item in Section 17.4 for the COL applicant to update the list of RAP SSCs with relevant plant specific information.

MEMBER STETKAR: Todd, I didn't get a chance to go back. A few minutes ago GEH indicated that there is a COL information item. I understood their discussion to be more comprehensive than what you have cited because this COL information item is pretty standard. It says if you have any plant or site-specific items, typically they are things like, you know, ultimate heat sink cooling water systems, that type of thing.

The COL applicant has to evaluate those to determine whether they should be added to the D-RAP list. Is there anything in the COL information items that specifically requires the COL applicant to go back and do a wholesale reevaluation of the D-RAP list at the time of the COL application? That's what I understood GEH to say just a few minutes ago.

MR. HILSMEIER: They need to ensure that the RAP, as described in the DCD, is current for their application. They need to reevaluate everything.

MEMBER STETKAR: Everything.

MR. HILSMEIER: Right. Including updating the essential elements of D-RAP which describes the organization that ensures the PRA is consistent with the design constructed plant.

Also there is a COL information item that during the design construction phase that they maintain a list of risk-significant SSCs because as a COL applicant develops their state of the art -- I shouldn't use that word because state of the art is controversial but as a COL licensee develops their plant-specific PRA and has it peer reviewed, they may be identifying additional risk-significant SSCs which also need to be included in the RAP.

MEMBER STETKAR: So there is that hook that if the COL -- at the time of the COL issuance there is another chance to go reexamine the entire D-RAP list, not just limited to site-specific items that might make it onto the list because of --

MR. HILSMEIER: Right. We always need to ask what are we going to do with this list of risk-significant SSCs. If this list was just going to sit on a bookshelf and nothing be done with it, then peer equality is irrelevant. What is going to be done with these risk-significant SSCs that we have acquired is after subjective -- mainly the nonsafety related RAP SSC are subjected to the quality assurance controls.

If they identify new risk-significant SSCs later on in the design instruction phase, they still need to make sure that the QA is controlled. At this point we just want as complete of a list as we can get based on the current quality of the PRA model.

MEMBER STETKAR: That's right. It's in principle in the COL's applicant's best interest to have this list as complete at this stage also. That's their business. That is a risk they are taking.

MR. HILSMEIER: It prevents them from having to look back.

MEMBER STETKAR: I just wanted to make sure that indeed there was that requirement that the COL applicant go back and reevaluate the whole list.

MS. CUBBAGE: I just wanted to set the record straight. What the DCD says is the COL information items is that the applicant will identify the site-specific SSC within the scope or RAP.

MEMBER STETKAR: See, that's different. That is the only thing that I found.

MS. CUBBAGE: That's the applicant item. There may be something else embedded in the commitment that we would have to dig into. I'll look to GE to clarify what they are committing to.

MEMBER STETKAR: It's a subtlety, Amy, but it's exactly -- I found that and that's what it says on the slide here but that requirement is simply --

MS. CUBBAGE: To add --

MEMBER STETKAR: -- to add anything from site-specific design features. And, as I said, in practice what we've seen with other design centers is they typically relate to things like ultimate heat sink. If it's a circulating water, perhaps specific configurations of electric power supplies because of interconnections with the switch yard and so forth.

They are typically items that the COL applicant says, "This is different in my site-specific design compared to the certified design. Therefore, I will examine this to see whether it should be included in the D-RAP list." I haven't seen people go back and re-examine anything on the certified design D-RAP list and add anything from the certified design to the D-RAP list that was not in the certified design document.

I haven't seen that happen and I haven't seen a requirement for anyone to do that. Yet, what I understood GEH to say is that some place there is the requirement to do that. I guess I'm asking where that is.

MR. WACHOWIAK: This is Rick Wachowiak. It's under COL Applicant Item 17.4-2. This is for one which is, as you said, add the site specific. 17.4-2 is to provide the description of the operational phase of the reliability assurance program which includes the following requirements and there is a list of bullets here.

One of them is to establish PRA importance measures, the expert panel process and deterministic methods to determine the site-specific list of SSCs under the scope of the D-RAP which means to go back and after you have your post-construction PRA which includes all modes, all standards endorsed by the Commission one year prior to fuel load, that peer review PRA to go back and use that and revalidate the list including establishing the correct performance -- I'm sorry, importance measures for those and the expert panel process.

That is where we see that there. That process needs to be revalidated. Once you've closed out all the DAC and built all the buildings and components that has to be relooked at.

MS. CUBBAGE: So what Rick is referring

to is in Section 17.4-1 of DCD Rev. 7, bulleted list of items under COL Item 17.4-2-A.

MEMBER STETKAR: Where is this, Amy?

MS. CUBBAGE: Rev. 7, page 17.4-1 which is --

MEMBER STETKAR: Page 17.4-1? Oh, okay. Got it.

MS. CUBBAGE: 17 of the PDF.

MEMBER STETKAR: I can look --

MS. CUBBAGE: 16 and 17.

MEMBER STETKAR: I can look at that over the break at lunch rather than taking up our time. I've got the Rev.

CHAIR CORRADINI: Let's keep on going.

MR. HILSMEIER: It's also included indirectly under the first COL information items. I don't have the --

MEMBER STETKAR: I'll look at it over lunch. I've got a reference, rather than taking up meeting time here.

MR. HILSMEIER: Let me just say this. Under the first COL information item the COL applicants also need to describe their essential elements of D-RAP. Part of the essential elements of D-RAP includes updating the list of risk-significant

SSCs.

It's not mentioned in there but when we review the COL applicant's FSAR, essential elements of D-RAP, one of the SRP acceptance criteria is to ensure there is a process for updating and maintaining the list of risk-significant SSCs.

MEMBER STETKAR: As long as it's not so finely defined as this, to say site and plant specific with the implication that that certified design D-RAP list can be passed through without a re-examination.

MR. HILSMEIER: Right.

MS. CUBBAGE: Right. The language is in the body of Section 17.4-1 that does expand on the COL Item 1.

MEMBER STETKAR: I'll read it over once. Thanks.

CHAIR CORRADINI: Right. Why don't we keep on going.

MR. HILSMEIER: Next slide, please. The next two slides presents the staff's review of the methodology that was used for identifying the risk-significant RAP SSCs in NEDO-33411. We issued about 10 RAIs with some supplemental RAIs on this methodology.

The RAIs address such areas as the basis for the risk-importance thresholds used for identifying the risk-significant RAP SSCs in NEDO-33411. Also have them develop basic events in the PRA for use in identifying the RAP SSCs and use of seismic margin analysis in identifying these RAP SSCs.

Next slide. The methodology for identifying the risk-significant RAP SSCS in NEDO-33411 includes the use of at-power and shutdown PRAs for internal and external events resulting in core damage and large radiological reduces.

Also, the expert panel's consideration of risk insights and assumptions from the PRA and severe accident evaluation and use of the seismic margin analysis, consideration of operating experience, use of the expert panel's review of all information associated with risk-significant determinations.

An expert panel also looked at those SSCs that were considered that risk significant to verify that they purely are not risk significant based on the procedures they described. The staff concluded that the methodology used to identify the RAP SSCs is adequate and meets the guidance in SECY-95-132 and SRP Section 17.4.

MEMBER STETKAR: Now, you've had a while to think about it. Here it comes. How does the staff rationalize the fact if we are looking for consistency in the design certification process among all the design centers, how does the staff rationalize the fact that the numerical criteria used for this one particular design center are different, and I don't like the term but I'll use it, less conservative than the criteria applied for all of the other design centers?

MR. HILSMEIER: I'm not sure how you define consistency. One can say the fact that we're using risk-important thresholds as long as the design centers are consistent, although ESBWR does use a different threshold criteria.

MEMBER STETKAR: If I have a component, I'll call it Component X for Design A, and failure of that Component X if it were unavailable, if that increases the risk from Design A by a factor of 2.0001, for Design Center A that component is considered to be risk significant and it's included in that design center's D-RAP list.

On the ESBWR if Component Y is unavailable and it increases the risk by -- I'm sorry, 4.99999, it is not considered risk significant.

MR. HILSMEIER: It may not. It depends on the expert panel's deliberation.

MEMBER STETKAR: The expert panel later on but just these numerical criteria first.

MR. HILSMEIER: I understand.

MEMBER STETKAR: In terms of -- I'm not taking issue with he absolute value understand, I want to be very clear, of the numerical criteria or the bases for those absolute values. I am taking issue with the fact that for consistency in the design certification process we do have indeed, this is true, four of the five that are applying the same numerical criteria.

MR. HILSMEIER: Right.

MEMBER STETKAR: One of the five is not. I would like the staff to explain why that is okay.

MEMBER ARMIJO: John, isn't the absolute value really the central issue if you are starting with a very, very low risk to begin with?

MEMBER STETKAR: Sam, that --

MEMBER ARMIJO: The Deltas it seems pretty reasonable to me --

MEMBER STETKAR: We're into the risk metric discussion which I am not going to --

MEMBER ARMIJO: I'm not sure where I am but I'm just trying --

MEMBER STETKAR: The fundamental issue of the risk metrics, which is a separate issue.

CHAIR CORRADINI: But let me ask you a different question, John. The question I proposed to the staff, if I understood correctly in the discussion with you before, they kind of buggered with those two numbers so that they would come up with a Delta CDF of one 10 to the minus 7. That's what they told us.

MEMBER STETKAR: That's what they told us. I don't know where that's documented but that's what they told us.

CHAIR CORRADINI: So I guess a question back is if that was an approach here and let's say for the moment that approach is what they did and you guys were aware of that -- you guys were aware of that?

MR. HILSMEIER: Right.

CHAIR CORRADINI: Okay. How does one rationalize that approach versus another approach? Let's pick another passive plant that one might be looking at. That's your question.

MEMBER STETKAR: Well, I'm not going to

differentiate between passive and active but --

CHAIR CORRADINI: There is another passive plant design that applies the normal numerical criteria and there are three -- well, I'm sorry, there are two passive plant designs that apply those criteria. ABWR is not considered a passive plant. There is one passive plant design and three nonpassive plant designs. All three of the nonpassive plant designs without getting into specific numbers show substantially lower core damage frequencies than the current operating fleet. I'm not going to split hairs about 10 to the minus five, 10 to the minus six down to 10 to the minus 30th because for this discussion those absolute values are not relevant.

MEMBER STETKAR: But your question is more of a question of consistency.

CHAIR CORRADINI: My question is entirely a question of consistency. If something for Plant X, whether Plant X is a passive design or an active design with 477 redundant trains of equipment, or two redundant trains of equipment, if failure of a piece of equipment increases the risk for that plant by a factor of 2, the designers of that plant have judged that increase in risk is large enough to be considered risk significant, whatever those words mean.

And on the ESBWR the designers of the plant have concluded that if failure of a piece of equipment increases the risk by a factor of 4.99999, that piece of equipment is not risk significant. That is a fundamental difference in terms of relative risk increase across the design centers. We do have a situation where four of them have accepted a consistent notion of relative risk. And it's relative risk, not absolute risk. It's relative risk.

MEMBER ARMIJO: You keep saying it but I can't understand it because it's where you are starting from where the relative risk change is of fundamental importance or not important.l

MEMBER STETKAR: It's the fundamental notion of risk significance, of risk metrics and risk significance.

MR. HILSMEIER: I can say one design center that I'm reviewing, I shouldn't say what design center it is but in reviewing the RAP list and they use the RAW 2 Fussell-Vesely of .005 and they have a very low CDF.

I would say the review of that list was

very simple because pretty much every SSC in the PRA was considered risk significant. That provides useful information if you include every SSC in the PRA as risk significant. The RAP is a focus on those SSC which are more risk significant in design and assure those SSC are given quality assurance controls.

MEMBER STETKAR: Todd, I'm not arguing about absolute values. I'm questioning consistency across --

MS. CUBBAGE: I think we'll have to take this one back and look at what are the acceptance criteria for this particular area. You implied that the others were kind of arm-twisted into something. Basically we have all these applicants. They have proposed something. It's been found acceptable in this regard. We can come back after lunch with additional information.

MEMBER STETKAR: That might be the best thing to do.

MEMBER SHACK: One of my analogies is when you come to LRF where there is no real definition of a large release, the different design centers have proposed different large releases. The staff has not judged anyone of them to be right but they have judged all of them to be acceptable so there is no consistency there but within the notion of what is acceptable they have found it.

MS. CUBBAGE: Right. That would be an analogy.

CHAIR CORRADINI: So are you saying we are in a gray zone of degrees?

MEMBER SHACK: It's just that we are not necessarily always consistent. The staff is looking for what is acceptable under the regulations and the Commission policy statements. It doesn't necessarily have to be consistent from design center to design center. LRF is the one where, in fact, the staff has been directed to give up trying to be consistent.

MS. CUBBAGE: Right. That's an example where this design center is conservative.

MR. HILSMEIER: I would like to present my thought process if you don't mind for why I feel this is --

CHAIR CORRADINI: Why don't that be the last word. You get the last word for the first time in history.

MEMBER ARMIJO: This is a key slide here.

MR. MISENHIMER: Do you want to finish with this and then come back to your slide later?

CHAIR CORRADINI: Yeah.

MR. HILSMEIER: May I present my thought rationale on --

Common industry practice for operating reactors which have the CDF range of 10 to the minus 4 to minus to the minus 6 uses a Fussell-Vesely of .005 and a RAW threshold of 2. Reg Guide 1.174, Appendix A, and SRP 19.2 Appendix C they state that the thresholds for defining risk significance should be a function of baseline CDF and LRF rather than being fixed for all plants.

As such, ESBWR chose the Fussell-Vesely .001 which is consistent with the approved certified ABWR DCD design. They also chose a RAW threshold of 5 for single-failure events which, again, is consistent with ABWR DCD design. The RAW threshold of 50 common-cause failure events, the use of this RAW threshold criteria common-cause failure events of 50 has a factor of 10 greater than single-failure events which is actually consistent with Reg. Guide 1201 which endorses NEI 00-04 for a risk ranking of SSCs under the 10 CFR 50.69 process.

Basically in the NEI 00-04 document the RAW threshold for common-cause failure is increased by a factor of 10. This document was heavily reviewed by the staff, by the ACRS and accepted. ESBWR used this same increase for consistency. The increase for common-cause failures, the RAW value was increased by a factor of 10 and 5 at 50.

Also, the ESBWR threshold criteria coordinates to a risk increase much less than the risk increase associated with threshold criteria for operating plants. Given all this information I cannot say that GEH's methodology is unacceptable. Given the absence of NRC's endorsement of a risk metric I feel this is adequate. This methodology is adequate.

There are many different avenues of approaching the definition of risk significance. Until NRC comes out with a risk metric I cannot say this methodology is not acceptable. To me it seems reasonable. If you use a RAW of 2 and Fussell-Vesely .005 almost everybody, many, many points would be unnecessary.

You had one comment about the TCCW being modeled --

MEMBER STETKAR: Let's wait until after lunch for that because that gets back into the -- it's a different topic. It's related but different. It's the expert panel process.

CHAIR CORRADINI: Let's finish off what you've got here and then we can break for lunch.

MR. HILSMEIER: This slide presents the staff's review of the list of risk significant SSCs in NEDO-33411. We issued about 25 RAIs considering the list of SSEs. These RAIs address such areas as requesting certain SSEs be added to RAP and the bases for not including other SSCs.

Risk-significant RAP SSCs is provided NEDO-33411. Our review of this list included examination of the risk important measures, consideration of risk insights and assumptions that are documented in the PRA, consideration of system dependencies and SSC subsumed within risk significant human error events, examination of the undeveloped basic events, use of seismic margins analysis.

I also compared the list in NEDO-33411 with other risk significant lists of other design centers to ensure that we are consistent. Also feedback from the staff that reviewed -- I incorporated feedback from the staff that reviewed Chapter 19 because they are most familiar with the PRA. The staff concludes that the list of RAP SCC is adequate for design certification and meets the guidance in SECY-95-132 SRP Section 1724.

Quickly, in summary the staff concludes that the methodology used to identify the RAP SSCs and the list of RAP SSCs is adequate and meets the guidance of SECY-95-132 and SRP Section 1724. All RAIs associated with NEDO-33411 are resolved.

CHAIR CORRADINI: Ask your question.

MEMBER STETKAR: Okay. I thought we were going to continue after lunch.

CHAIR CORRADINI: I'll give you six minutes.

MEMBER STETKAR: Okay. Thank you.

CHAIR CORRADINI: No problem.

MR. HILSMEIER: I'm really sleepy after lunch.

CHAIR CORRADINI: What did you say

MR. HILSMEIER: I'm really sleepy after lunch.

CHAIR CORRADINI: So you're ready now.

MR. HILSMEIER: I eat lunch at 5:00.

MEMBER STETKAR: You heard the interchange earlier regarding the expert panel process.

MR. HILSMEIER: Right.

MEMBER STETKAR: I don't know how to praise this question because I read -- I don't have all of the RAIs as you are aware. We don't get all of the RAIs. The concern I have, and I use TTC view and balance of plant chilled water as examples only because they were simple systems that I could understand what they did.

I don't know the scope of other systems that are not in the PRA that were either evaluated or not evaluated by the expert panel to make their determination of why they are not on the RAP list. I'm curious about how the staff's review examined that part of the expert panel conclusion process.

In other words, that we have assurance that, indeed, the expert panel examined systems that are not explicitly modeled in the PRA and made an active determination that they do not belong on the RAP list for a variety of documented technical reasons.

MR. HILSMEIER: That is my biggest concern in reviewing the RAP list. I'm more concerned about what is not on the list than what is on the list. If it's on the list and doesn't belong there, it's conservative.

MEMBER STETKAR: Indeed later refinements of the process, different determinations of numerical risk metrics, etc., etc., might find justification for removing things from the list. You're right.

MR. HILSMEIER: Identify all those systems first at the system level that are not on the list and I investigated myself digging into the PRA model and looking at the risk insights, assumptions, and how it's modeled.

If I feel that it should belong on the RAP list, I did ask RAI about the TCCW and the balance of plant chill water system. Actually they are modeled -- I believe they are modeled in the PRA at a very high level like an undeveloped event or maybe subsumed within another event. It's been a year and a half or two years ago but I did ask -- I forget the details but I did RAI on those systems.

GEH responded to my RAI justification why they are not in RAP and satisfied with that. I looked beyond risk thresholds and Raps to absolute values. One issue is the assumptions within the PRA can impact a RAW value for just train alignment.

I found some SSCs were not included because of the assumption of the train alignment being included there. This is a common issue for other design centers, too. I'm very focused on making sure to identify as many systems that I can to ensure that those systems do not belong on the RAP list.

CHAIR CORRADINI: So can I just say back what you just said to me? What you're saying is you probably -- well, you used two examples. You did write up RAIs when something based on your judgment ought to have been there and wasn't there you checked why wasn't it there and what was the reason. The justification is buried somewhere in RAI response from whenever you asked it.

MR. HILSMEIER: Yes.

CHAIR CORRADINI: Okay.

MR. HILSMEIER: I would have to go back and look. It's something that I can probably address through a letter, the reason being is because there are various revisions. To talk about my final decision and whether there are some things in RAP or not gets confusing because there are various revisions in the NEDO report, various revisions of the PRA. Also the methodology for the NEDO report changed over its life.

MEMBER STETKAR: Oh, it did?

MR. HILSMEIER: So what we had is a handful of SSCs that went in RAP and stayed in RAP. It's obvious they are risk significant. The gray area of the SSCs sometimes they were put in and taken out and put back in. My focus was on the end result which is those SSCs are they in RAP or not and why.

MEMBER STETKAR: And the key is "and why." At the point that the design is certified we have one tool. It's called the PRA and, indeed, that tool is auditable in the sense unambiguously given enough time determine whether or not something is modeled in the PRA.

In other words, is there a basic event that somehow accounts for the failure of a piece of equipment. That is documented. What's in the PRA and the conclusions that derive from the PRA model is something that is indeed documented at this stage of the design certification process.

What seems not to be documented is the expert panel's evaluation of everything else in principle and their justification for why something is not on the RAP based on their evaluation. I don't see that.

MS. CUBBAGE: GE, could you explain? Do you have the documentation on site for the expert panel?

MR. MILLER: Like Todd said, this has all transpired over the past several years. There is nothing I can think of right now. I would have to go back and look.

MS. CUBBAGE: I mean, the question isn't just what we have on the docket but if you're looking at what supports the life of the plant and the future operational phase, there is additional information that GE would have that is nondocketed information. I don't know if that's what you're getting at.

MEMBER STETKAR: I would have hoped when I asked them about that they would have said, "Certainly, we have our backup files and I got the answer no."

MS. CUBBAGE: I would just also offer talking about the number of RAIs isn't always that relevant but there were 55 RAIs that Todd asked a number of which were asking us about specific components and the justification for why they were not included in the RAP list.

MR. HILSMEIER: And we asked for an expert panel.

MEMBER STETKAR: I think a little bit what bothers me is you did ask a lot of questions and as a result of your questions they added things which troubles me a bit about the process. You understand my concerns.

MR. HILSMEIER: I was concerned about

that also but it's common amongst the other design centers.

MEMBER STETKAR: It's what? I'm sorry?

MR. HILSMEIER: Common with the other design centers also.

MEMBER STETKAR: Okay.

MR. HILSMEIER: Part of the problem is the SRP 17.4 guidance has a lot of parts that are unclear. The SECY-95-132 document which is the basis for RAP there are parts about D-RAP which is very unclear and that led to the SRP 17.4 having unclear parts. Add that to the applicants being confused so as a result the list --

MEMBER STETKAR: We have all been.

MR. HILSMEIER: Yes, it was evolving. In two RAIs that we were able to communicate to the applicants what we expect of the list. That is why initially the seismic margins analysis was not considered and that's because the way SRP 70.4 is written. Because of the RAIs we require them to consider seismic margins analysis.

The ISG 18 that's coming out, hopefully next month, they have one last public meeting on it, all that is clarified. With that ISG we will no longer need to issue RAIs to clarify to the applicants what are expectations are.

CHAIR CORRADINI: Other questions to Todd so he can go have his lunch or a nap, I'm not sure which. I'm just joking with you.

Any questions for Todd? Okay. At this point let's take a break for lunch. Back at 1:15.

(Whereupon, at 12:16 p.m. off the record for lunch to reconvene at 1:15 p.m.)

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

1:15 p.m.

CHAIR CORRADINI: We now want to continue in discussing regulatory treatment of nonsafety systems. I'll turn it over to Gary or Rick or the team and we'll start off.

MR. WACHOWIAK: Okay. For the record again, I'm Rick Machowiak from GEH.

CHAIR CORRADINI: Can I stop you actually? I'm going to lose a member, I just realized, and I want to tell everybody now that we have all the members sitting here, except for one committee member, there has been a change in schedule for July.

We were scheduled to have our next subcommittee meeting on July 12th Monday because there would be a fuels meeting on 5046(b) on Tuesday. That meeting has been postponed so we are planning now to move our subcommittee meeting to Tuesday the 13th, the day before the full committee.

That allows us not to have a gap so that we can't go the baseball game and that sort of fun stuff but we actually have to be here so we're going to have it on the 13th, same thing. We are going to be dealing with long-term cooling for the ESBWR since that is a requirement, an SRM from the Commission.

Also that will kind of prepare us for the final chapter 6 SERs with no open items later in our subcommittee session. Please write it down. The subcommittee meeting is going to be on the 13th on Tuesday, not on the 12th.

MEMBER STETKAR: That's firm.

CHAIR CORRADINI: That's firm.

MEMBER STETKAR: So we can change travel plans.

CHAIR CORRADINI: That's firm.

MEMBER ARMIJO: I just made my travel arrangements.

CHAIR CORRADINI: I'm sorry.

MEMBER ARMIJO: It was mine that got canceled but I didn't know that there was flexibility to move this one up.

CHAIR CORRADINI: The meeting powers that be informed me that over lunch so we will comply.

MEMBER ARMIJO: I will comply but I won't like it.

CHAIR CORRADINI: Sorry. I just wanted to make sure before I lost Mike that everybody knew about the change in schedule and then we'll pass it on to Commissioner Brown who is not with us today.

Rick, go ahead.

MR. WACHOWIAK: All right. As I said, I'm Rick Wachowiak from GEH. I'll do the play-by-play and Gary will do color.

The topic for this afternoon is Regulatory Treatment of Non-Safety Systems. In our DCD that's in Chapter 19A and Chapter 22 in the SER so there is a little bit of a disconnect there but they are the same thing.

Prior to DCD Rev. 4 we had a meeting on RTNSS. I believe it was in June of 2008. At least that's what my slide said. We covered categorization then and we covered the configuration changes that we needed in the plant then.

Our focus since then has been on addressing the correct treatment for RTNSS. The focus in my presentation is on treatment but if you have any questions on categorization just go ahead and bring them up.

MEMBER ARMIJO: Just a top-level question.

MR. WACHOWIAK: Okay.

MEMBER ARMIJO: Is all the RTNSS equipment now identified?

MR. WACHOWIAK: Yes.

MEMBER ARMIJO: The staff and GEH are in sync on that?

MR. WACHOWIAK: Yes.

MEMBER ARMIJO: Okay.

MR. WACHOWIAK: Okay. Long list of RAIs here. I'll cover those in most of the presentation pages. I won't read through them here. So the first -- go ahead.

MEMBER STETKAR: I'm sorry. On the categorization process there are five criteria that you used: A, B, C, D, E.

MR. WACHOWIAK: There are five different sets of requirements that bring things into RTNSS and we call them five different categories.

MEMBER STETKAR: Categories. Are they interpreted as mutually exclusive categories? In particular I'll look at RTNSS B which is post-72 hour response. RTNSS C is anything that comes in from the risk-significance issue so it's PRA related.

Are they mutually exclusive in the sense that something would be on the list for RTNSS B.

What I'm going for is the quality controls and all of that stuff that would be enhanced, you know, seismic qualification and that sort of stuff. Could there be things that are on the list because of RTNSS C that are also required for post-72 hour response that if we didn't have a PRA, for example, would be on the list for B.

MR. WACHOWIAK: Right. The list were generated independently and I know at least at one point in time we had things listed as some things that were overlapped in B and C. I don't know if there are any on the list now.

MEMBER STETKAR: I didn't see it. The list seemed to be either A or B or C or D or E.

MR. WACHOWIAK: The other thing, though, if you look at when we get into the slide on what the treatment is, if it would be something that goes on for B and C, then you would pick the treatment for B because that is an all-encompassing for C treatment.

MEMBER STETKAR: Yeah, I understand but that would only apply if, indeed, the classification showed this was on the list for B and C.

MR. WACHOWIAK: It would show up. It would be on the list for B if it met B and that would be the higher category. Do you remember when we changed or if we changed them from B and C listed or did it change because the categorization actually changed?

MR. MILLER: I think it changed because of the categorization. That's laid out systematically in 19A as well so that we talk about each one separately.

MEMBER STETKAR: Yeah, you do. I was just curious because it's hard when you get down into some of the subtle things whether there was overlap or whether --

MR. WACHOWIAK: There can be overlap. I don't think they are turned out to be any overlap in the end. I don't remember seeing any on the final -- you have the final list.

MEMBER STETKAR: Certainly in the tabulation it simply list a single category for each.

MR. WACHOWIAK: I think that's the way it came out. Okay. So one of the issues it was covered by two RAIs and were listed as two open issues in the SER dealt with the seismic criteria using International Building Code version 2003. At the time we had a RTNSS Class B1 and B2 where B1 were those things that affected core cooling, long-term core cooling and B2 was long-term post accident monitoring and we had two sets of criteria for those two categories.

It turns out that when we were done with all the discussions on how we were going to provide the long-term control room habitability cooling and how we were going to deal with the long-term containment cooling or long-term containment pressure with the fans we ended up adding the ancillary diesel generators as we spoke about this morning a little bit in electric power.

When we added the ancillary diesel generators we found that it was just more difficult to keep track of the B1 and B2 for the core cooling and the post-accident monitoring so we dropped that idea and this went to a straight Category B where it included everything in there.

That made the point about IBC-2003 moot and it turns out that in the document we list anything associated with RTNSS B to be seismic Category I or seismic Category II and those meet the requirements for that.

As I said, we had the two categories. This list what they are, core cooling, containment integrity, control room habitability with respect to dose. And then B2 was post-accident monitoring which included the springs in the control room long-term and it also included the long-term cooling of the control room. We combined these into one and our new Category B is the union of B1 and B2 from before so there's no difference.

So what's the treatment that we have for this? We are required to have redundant functions in RTNSS B. In B those are those things that are required after 72 hours to either perform safety functions or to refill the inventory of safety-related equipment. It acts just like safety-related equipment. The main difference is that it's not needed for 72 hours.

That allows for all sorts of different recovery actions and things. It's allowed to be non-safety related because it's not needed for 72 hours. But it doesn't mean it doesn't need to be single failure proof. We have redundant functions, flood and fire protected. We keep these all in buildings that are hurricane and missile protected. We also have an EQ program associated with it so everything in RTNSS B does go into the EQ program. At least seismic Category II for the building and anchorages on these. We do have to identify quality suppliers. They don't necessarily need to be

Appendix B suppliers but they do need to be quality suppliers, ISO-9001, something along that line. There needs to be a program.

Then the availability controls that we have for these we put in the Availability Control Manual. That's also in Chapter 19A. It looks like a set of tech specs but it's not. It's availability controls.

It's similar to what the plants today have now in their Technical Requirements Manual. It's an older control document that has additional surveillance and other availability controls for their equipment. Here we identify in there allotted outage times for equipment and some specific testing requirements for this equipment.

Okay. To get back to answering the specific seismic question, we did add Table 19A-3 and listed all of the buildings for the RTNSS B functions and what their seismic category is. As you can see, they are all in either Category I or Category II structures.

Any questions about that open issue?

MEMBER STETKAR: Yes. Maybe you can help me out.

MR. WACHOWIAK: Okay.

MEMBER STETKAR: The fire protection, the diesel driven fire pump is in for RTNSS B. The piping from the pump out to the connections to the fuel pool and the PCC pools are all seismic Category I.

MR. WACHOWIAK: That's correct.

MEMBER STETKAR: That piping also connects through normally open manual valves to the main fire protection ring header.

MR. WACHOWIAK: I don't think that's the case anymore. I think --

MEMBER STETKAR: Ah, I didn't have DCD Rev. 7. On DCD Rev. 6 it shows normally open valves into the main ring header from that, you know, the main discharge line.

MR. WACHOWIAK: Okay. I see what you're talking about. From the pipes into the main headers --

MEMBER STETKAR: In other words --

MR. WACHOWIAK: From the pumps into the main headers that's there. Then there's isolated lines that go to the pool. Where it breaks off the main header to go the pool that's isolated with the manual valve. The fire pumps are still fire pumps and need to act like fire pumps.

MEMBER STETKAR: That's what I mean. That valve was normally open in case I have like a fire. It's a good idea not to have somebody go out and have to open that valve.

MR. WACHOWIAK: That's right. They are required to be open.

MEMBER STETKAR: The question is for a seismic event now your design basis, your .84g or whatever your qualifying stuff is, is that connection -- I'm assuming to make the diesel -- the motor pump, I guess, and for that matter the diesel pump in particular because that's the one that is inherently qualified, available for the pools an operator would need to go close that manual isolation valve because I suspect the rest of the fire protection ring header is not necessarily seismic Category I.

MR. WACHOWIAK: The reason that -- that's a good point and I think we'll have to check on it.

MEMBER STETKAR: The question is accessibility to that valve and survivability of that interconnection point to ensure that I can establish isolation for that long-term cooling function.

MR. WACHOWIAK: Right. So the reason that the diesel fire pump is seismic Category I is an NFPA requirement. It's not a RTNSS requirement for that to be Category I. That's why those things are Category I on that list so it's expected that diesel fire pump and the tank and all the piping that's associated with it would survive the seismic event. That is the reason it's set up that way.

The particular valve that you're talking about I'm not sure if that valve is located inside the fire pump enclosure. If it is, it's in a seismic Category I structure and it would be protected. The only other place that it would be located is outside in the yard and outside in the yard isn't necessary subject to an issue with the seismic event or to accessibility in this case. I would expect that valve would be placed inside the fire pump enclosure, though.

MEMBER STETKAR: I'm not sure. I can't read the drawing that I've printed out here.

MR. WACHOWIAK: It's a simplified P&ID.

MEMBER STETKAR: It's a simplified P&ID but it has little dotted lines on it and I can't read what's inside the dotted lines at the moment.

CHAIR CORRADINI: Can I do that for you?

MEMBER STETKAR: No. But, indeed, the valve is at the boundary on the dotted line so the question -- I don't know. It may be in the yard.

MR. WACHOWIAK: So either one of those two places I would consider accessible in a seismic event. It's also a requirement and would need to be accessible because under the EQ program the equipment needs to be able to operate in the environment that it's subject to so accessibility --

MEMBER STETKAR: My basic question was to make sure that I understood where those lines were and where that valve was and whether its accessibility after the seismic event would be considered.

MR. WACHOWIAK: Once again you get to a point where when we make the decision of what goes into RTNSS and what doesn't that is somewhat subject to our choice because we have other things that could have performed these same functions. We chose this diesel power pump to do that function because it already was seismic Category I and was designed to the right standards for that treatment.

MEMBER STETKAR: I'm not arguing about the selection. Given the fact that you have made that determination, I wanted to make sure that it indeed is available.

MR. WACHOWIAK: Right. All right. The next issue that we had was that there was a confusion about how we treated support systems in RTNSS area. We had three designations at out table back in Rev. whatever it was, Rev. 4 I believe, that were listed as high regulatory oversight which implied technical specifications for available controls, low regulatory oversight which essentially pointed to the available controls manual for available controls, and then we had something listed as support systems.

There was no discussion about what do you do with support. We have since clarified that everything that was in support, or in support of LRO equipment, and it all had LRO treatment. DCD Rev. 7 now explicitly states what the treatment is on all the support systems so the ambiguity is gone.

Just to cover what the treatment is for RTNSS C, in RTNSS C are the things that were brought into RTNSS to address the probabilistic concerns, the things needed to keep the CDF within the Commission's goals.

We have redundant active components similar to what was for the RTNSS B, flood and fire protected, hurricane, Category V missile protection, design for accident environment. We have quality suppliers. Technical specifications.

If it's absolutely needed to meet the

goals using the mean values like EPRI suggested in their resolution to the RTNSS issue that created the Category C category and for other things that we have we put in availability controls for, those are the ones that are in RTNSS to address uncertainty issues.

It says here Availability Control Manual for front-line systems. For support systems we use maintenance rule monitoring as the availability controls for it. Two exceptions now to that, our diesel engines. Those are treated like a front-line system even though they are just a support system so the diesels are treated with available control manual explicit entries, treated like a front-line system.

I think I've got some examples here of these. RTNSS A which are associated with at-risk rule and Station Blackout rule. Those are all -- those particular functions are treated with Availability Control Manual. They didn't turn out to be risk significant or significant in the focus PRA.

Our RTNSS B, diesel-driven fire pump, it's also a ACLCO, which stands for availability control limiting condition for operation. We have the diverse protection system. It's one of our diverse control systems for GDCS injection. That particular system was determined from the focus PRA to be required to keep the core damage frequency or the large release frequency below 10 to the minus four for CDF, 10 to the minus six for LRF. It requires technical specifications.

On the other hand, the DPS function for performing the backup scram does not meet that same threshold. It is not needed to keep the core damage frequency below 10 to the minus 4 through large release frequency below 10 to the minus six using mean values. However, when we consider uncertainty it just barely crossed the line so we would say for things that are associated with uncertainty we treat it with an Availability Control Manual.

FAPCS in the LPCI and SPC, that ended up being in for uncertainty and we have availability controls on that. The BiMAC comes in under Category D which is like Category C except it's for the containment performance. It's to essentially keep the containment contribution to protection of a large release at approximately .1 or less. Our BiMAC device does that.

You'll notice that we don't have an ACLCO on this one. We just have a description in the Availability Control Manual. That's because it's not something that can be tested while we are on line.

It has an entry describing its importance and how it is expected to perform. It's mostly like a bases section essentially without any sort of surveillance.

CHAIR CORRADINI: There is no surveillance, though, on piping or basemat material or anything?

MR. MILLER: There is an ITAAC.

MR. WACHOWIAK: The ITACC confirms when we build it and --

CHAIR CORRADINI: And that's it.

MR. WACHOWIAK: That's it. Okay. We do have some things under E which is the search for adverse system interactions. That is where the failure of a non-safety system could adversely affect a safety-related system. Here it's a little bit of a different case because it's not really -- it's the operation of this system that could be the adverse system interaction.

If we turn on the reactor building HVAC post-accident filters and the filter is cracked or bypassed somehow, that is really the failure of that filter. The failure of that filter could cause -- it doesn't cause a failure of any safety-related system but it could cause a release so we put in an availability control on that.

It is essentially the same as testing stand-by gas treatment charcoal filters. It's like that except it's in the Availability Control Manual. I added one structure there, fire protection water tank. It's no different than other things that I previously said.

The next three I have on there were showing the difference between a support system and the diesel generator as a front-line system. You can see the standby diesel generators. They are in RTNSS C because they are needed. Not necessarily needed. They support continued AC power for the FAPCS function. The FAPCS function is RTNSS C. That makes the standby diesel generator RTNSS C as well but we have availability controls, LCOs on those, just like they were a front-line system.

Whereas the AC power buses for the ancillary generator or the 6.9 kV PIP buses those are support system and we monitor those under the maintenance rule. Basically anything in RTNSS, as Gary mentioned earlier today, is supposed to be put into the maintenance rule as high-safety significant systems. Therefore, they are monitored for both availability and reliability under the maintenance rule.

I think we passed out the entire table that goes along with this 19A-2 if you want to look at more. This is just some loadable features.

MEMBER STETKAR: One -- I'll have questions later on on the ACLCOs but you have more presentation and discussion on that. On the list, again, like my failed attempt on the TCCW system, I'm trying to think about things that are not on the list and why they might not be on the list. I think the staff actually asked about one of these. It's kind of a backwards questions, though.

The list includes the control room ventilation system. It's not on our slides here but the full list does because it's necessary for post-72 hour operation. I think that is the rationale. It also includes -- yes, it's a RTNSS B. It also includes, I believe -- let me just make sure. You know this better than I do, the Q-DCIS. Right?

MR. WACHOWIAK: The Q-DCIS is safety related so it wouldn't --

MEMBER STETKAR: I'm sorry. That's right. For post-accident monitoring, arguments were made that says beyond 72 hours you need power Q-DCIS. Ancillary diesels are in there for that. It says Q-DCIS has localized cooling from control room ventilation system.

When I look at the DCD most of the Q-DCIS cabinets are out in other parts of the control building that are not cooled by control room ventilation. They are cooled by the control building general area ventilation system. I was curious in the sense of support systems for post-72 hours or post-accident management functions why the control building general area ventilation system wasn't listed.

MR. WACHOWIAK: Okay. There are a couple different things. You are all in the control building, right?

MEMBER STETKAR: I'm in the control building. The reactor building is different.

MR. WACHOWIAK: The reactor building is different.

MEMBER STETKAR: The reactor building is on the list. I don't know why it's on the list but it's on the list.

MR. WACHOWIAK: The equipment that is out in the reactor building doesn't really have the same kind of heat generation capability. The Q-DCIS is cooled essentially by the walls and the ground, as we spoke about several weeks ago here, for the first 72 hours. Then after 72 hours right now we don't know whether or not cooling is going to be required for that equipment. What we had in there was the capability for whatever is providing the cooling to the main control room to supply some duct down to there to provide local cooling to those rooms if needed.

MEMBER STETKAR: You remember the words really well.

MR. WACHOWIAK: That was going to come from the same chiller unit that is providing the control room habitability area cooling post-72 hours. We are not sure exactly what we need there yet but the provisions are there if we need to put it in.

MEMBER STETKAR: I guess if the design hasn't been finalized would it be prudent to add the general area of ventilation at this point?

MR. WACHOWIAK: That's not part of the general ventilation area. That is part of the habitability ventilation area. The general ventilation area are some very large blowers that are set up for normal operation for cooling the whole building.

MEMBER STETKAR: Now, I'm not a wind-loading guy. The RTNSS B structures, and I guess you are saying RTNSS C now, are designed for 195 mile an hour five-second gust. The high wind loading requirements for Category I structures are only hit 150 miles an hour five-second gust. Look up Table 2.0-1.

MR. WACHOWIAK: That doesn't sound right.

MEMBER STETKAR: I don't know Rev. 7. I just got Rev. 7. Certainly in Rev. 6 I think it's Table 2.0-1 where you have the requirements for buildings. I can look it up quickly. I was curious about whether in Rev. 7 it had changed.

MR. WACHOWIAK: Take a quick look there.

MEMBER SHACK: The design is the 195 three-second gust.

MEMBER STETKAR: What design?

MEMBER SHACK: For the building.

MEMBER STETKAR: No, I didn't go down to 3.

MS. CUBBAGE: So the siting is more restrictive than the design. Is that what you're saying?

MEMBER STETKAR: No, the siting is less restrictive than the design which is okay.

MR. WACHOWIAK: The siting would be more restrictive because you could not --

MEMBER STETKAR: I'm sorry. You're right.

MR. WACHOWIAK: We probably ought to take a look at that in Chapter 2.

MEMBER STETKAR: You're right. The siting is more restrictive because you couldn't site it if you expected higher than 150-mile-an-hour three-second gust even though the buildings, according to the design, are 195.

MS. CUBBAGE: Chapter 2 will be coming over to you shortly to support the August Subcommittee meeting. That would be an appropriate discussion.

MEMBER STETKAR: I just wanted to make sure that I understood the differences between those two tables. The 150 is pretty standard across all the design centers and I thought I had remembered that. Sorry. Thanks.

MR. WACHOWIAK: Another follow-on issue that we had was that it wasn't clear what the oversight was going to be for some of the equipment. This gets back to the support system not being clear as to what that was. I think originally we just had the HRO LRO and then a discussion in the text as to what was going to be the availability monitoring.

The table you have there, 19A-3, you can see it's listed explicitly where it's covered in tech specs or the Availability Control Manual, or if it's going to be just covered in the maintenance rule. That closed that issue.

The next issue it was associated with the bases not being explicit as the level of protection or the level of degradation that you could get to before the system was determined to be not really inoperable because it's the Availability Control Manual but unavailable.

We addressed this by in some of the cases we clarified the number of decisions required for the ACLCO. Other ones were designated as it was treated as a single train and we wouldn't necessarily do it on a divisional basis. Essentially we went through and we identified what number of divisions were needed. The other thing that we put into the response was that in any case whenever you have a component failure in one of these systems you enter action A of the ACLCO and you do an availability determination. As we have more experience in the digital control systems as to what is operable or what makes it available versus not and with some of the other systems that you would look at the actual capability of the system. Essentially what you are going to do is each time you would have a component failure you would do a capability assessment of the equipment to determine is it available. It's something like a maintenance rule A4 sort of assessment. Here rather than being done prior to entering a new maintenance condition, you would enter it based on a component failure that you would discover. It could determine that the system is still capable of performing its function. Therefore, it's available and you wouldn't be in the ACLCO, or you would determine that it is unavailable and you would be in it.

The next open issue was associated with the surveillance requirements for FAPCS. The main issue here was that in the PRA we have in the model that there are two loops of FAPCS but the ACLCO power operating modes only identify one as being required.

We go through and we would do the evaluation kind of like an A4 maintenance rule evaluation. If for some reason it looks like it's going to be a risky condition, they would manage the risk through ACLCO 3.0.3 but the cutsets just didn't support adding the second diesel generator into the number of divisions required for this ACLCO.

In the end with all that list there RTNSS was one of the last things to get started on this review of the ESBWR so we probably had the most open items since the last time we spoke but I think we were able to work our way through all of those open items and come to an acceptable conclusion on each of them.

MEMBER STETKAR: I'm trying to get my hands around this notion of the PRA justification for both the number of items that are specified in the ACLCO and the -- I don't know what to call it -- what would normally be called the allowed average time, whatever you call it. There are a lot of statements at least in the SER that they are justified based on the PRA.

The PRA success criteria requires 6 but it takes credit for all 12. None of them, zero of them have any unavailability due to other than hardware failures. In other words, there is no likelihood that any of them are out of service for maintenance or whatever.

MR. WACHOWIAK: I'll try to work backwards through it.

MEMBER STETKAR: Tell me about the diesel first. That's easier to kind of get my hands around.

MR. WACHOWIAK: The way that we determine whether or not these things in the C category of RTNSS needed to be there was a little different than if you look in the SECY on how you would determine that something is RTNSS. If you pulled one of those systems out with everything still at the mean value, then it warranted a tech spec LCO. If you take any one of the loops out you don't exceed the goals with the mean values. If you take any one out, it's just borderline if you don't meet it using the uncertainty values. With the uncertainty values you are right up near the limit. You pull the diesel out you're not even close to that because most of the cutsets where you require the FAPCS have some sort of other power supply available. We think that's appropriate because the risk isn't affected that much by taking that one diesel out, at least as much as taking the one FAPCS pump out.

MEMBER STETKAR: Okay. I sort of at least understand how it should work.

CHAIR CORRADINI: Are you happier now?

MEMBER STETKAR: I'm happier. I'm still a bit confused.

CHAIR CORRADINI: Should we let staff come up?

MEMBER STETKAR: Fine. Keep your meeting going.

CHAIR CORRADINI: Staff is ready.

MR. MISENHIMER: Okay. I'm Dave Misenhimer again. I'm the Chapter PM for Chapter 22 which we are going to go over next. Mark Caruso is the lead technical reviewer. He's going to do the presentation and go through the open items.

MR. CARUSO: Thank, Dave. I was lead for coordinating this RTNSS review. There were a lot of other people involved. Unfortunately, most of them are not here today. We might get into some things that I probably won't be able to answer questions.

This topic we were just discussing, I was going to speak to this but at the end like these open issues I had my structured to track along with Rick but, if you want, we can skip right there and I can make my little speech about this. It should go pretty fast because of the information that was provided was provided by Rick and I just want to comment on why we thought what they told us was incorrect.

Slide 3, the agenda is to give you one slide on background, how we got to where we are, where we stand now, and then really go into discussing the open items that we were left with the last time we talked to you. Rick has gone through those and I'll just talk a little bit about our review and our perspective on it.

In 225.16 this was about the oversight of some of the RTNSS equipment. This, again, was a case where we didn't really have a problem with the oversight because they were telling us what it was in the RAI responses. We wanted it in the DCD. They finally committed to put it on the DCD and incorporated Table 1983. The DCDC came in and checked with us all there so we were fine with this.

In terms of the definition of available the tech specs are very clear. It's very clear to tell when it's applicable or not. Here there was nothing. It was like it was unavailable. What does that mean? Does that mean it's slight degraded? How do you know when your degradation has made it unavailable?

In probing that GE came up with an approach that was satisfactory which was to say, okay, if there is anything wrong with it, you lost surveillance, and there were a number of things added to the ACM to make sure the surveillance has covered all the stuff that could affect availability, if there is anything wrong it, we are going to immediately call it unavailable and go into the action station and follow it and, at the same time, investigate.

As Rick said, it may turn out that it wasn't really unavailable or it is but at least for the purpose of knowing what to do, what the LCL really needs, when do I take action and when don't I take action, that was written into the manual as the way to do that so we were happy with that.

These things are not based on PRA analysis and deriving them from cutsets and calculations. The most relationship there is between the action times and the PRA is that they have a relationship to the assumptions in the PRA about availability and they are for the most part bounded by those assumptions. That's about it

MEMBER STETKAR: Yes, except for the fact I brought up the diesel only because it's one of the few areas that I could actually find some rationale. For example, as I mentioned, both the standby diesel and the ancillary diesel explicitly have maintenance unavailabilities that are nominally equivalent to about 15 days per year. They are in the PRA and they are in a general sense consistent with those times and the ACLCO. The ancillary says both must be available and if one is not available, it's a 14-day time.

Stand-by diesel says only one has to be available so one can be unavailable infinitely but that's a previous discussion we had with GEH that somehow, somewhere the maintenance rule eventually kicks in and hopefully saves you there.

In a lot of other areas, in particular the GDCS deluge valves and there was some discussion about the number, for example, of channels, divisions I think it's called, that must be available for accuation of things like standby liquid control. There are arguments saying only two divisions need to be available. Only six deluge valves needs to be available.

The PRA in those cases does not have any quantitative unavailability other than it presumes the equipment is always there. It has the ability to fail to function when one required but it's always there. Unlike the diesels that there is some likelihood that it's not actually there the equivalent of like 15 days out of the year.

In many cases for those functions, the deluge valves, and I tried to find it in the I&C,

there was nothing in the PRA that says it might not be available when demanded. It can fail. I'm not clear at all how the PRA provides any basis whatsoever. It could be 300 days.

MR. CARUSO: Yeah, I agree.

MEMBER STETKAR: The PRA essentially assumes zero days.

MR. CARUSO: In cases where there is an unavailabilities factored into the basic events, I think they try to use that as a guide. In some cases there aren't and you are absolutely right. Here is where, you know, you say we hope the maintenance rule saves us. Well, the maintenance rule is it.

Remember, these availability controls all it says is after seven days or after these days, you know, do your best to get it back. It doesn't say if you are unsuccessful. All it really says is if you are not successful, use the maintenance rule.

I mean, that statement in there about managed risk for practical purposes for this facility because GE has placed all the RTNSS equipment into the reliability assurance program it automatically is covered by the maintenance rule so whether or not that 303 is in there or not doesn't really matter because they would have to apply A4 of the maintenance rule and see whether or not it really made a different with the real PRA, the one that really counts, the one that is there on site.

It better have the best information in it. You know, I think what Craig and I feel like, you know, you got to see to be logical to so much debt. You ought to have something in there but they are not that crucial. If the idea is to give the operations people the sense that this stuff has some importance to it and you can't just ignore it. You need to do something.

Now, the diesel, you know, I think they basically said, "I need support for this and I don't want to be without support. But if, in fact, I were to lose them both and not have it supported, I already through the PRA found that wasn't a big risk in terms of approaching the safety goals or whatever."

My feeling was I didn't really understand that either. I'm not sure I still like it but I'm relying -- you know, it's like I think to myself their PRA that they've done now, you know, what really counts is when that thing really comes out of service, at the time it does, what else is out of service? What is the plant like and what PRA am I using then? I sort of said, you know, fine. We accept it. Let's just move on.

MEMBER STETKAR: My concern, I hear all of this and I understand it. I think I know how the maintenance rule is going to kick in. I think I understand how the ACM works. My concern as a PRA person and having lived through all of this stuff for years is under your third bullet, staff findings, the sub-bullet says, "Repair times in ACM are reasonable and bounded by assumptions in PRA."

MR. CARUSO: When there are assumptions there.

MEMBER STETKAR: When, indeed -- well, if there might be some assumptions. But, indeed, that is not a truism. The implications of this is that somehow we have a rational set of times in the ACM that are somehow justified by the PRA which is, indeed, a fabrication.

MR. CARUSO: There is another part to rationality here. There's a part that says they've got to do something. They got to fix it. They got to get it back. What are reasonable times? When we did tech specs you look at what is a reasonable time to do it and what is my safety. If it was all safety, you would say, Mark, shut down immediately."

MEMBER STETKAR: You're right. Forty years ago, 50 years ago when people were making up the concept of tech specs, people said, "Seven days sounds like a reasonable time to be able to fix a diesel. We'll put that in there. Yeah, you know, three days sounds like a reasonable time." There was no concept of deriving those times based on an assessment of risk. It was reasonable risk. I view the times in the ACM as reasonableness. To say that they are reasonable and bounded by assumptions in the PRA says that there is a risk. I won't call it based and I won't call it informed because those are specific legal terms. There is some risk support for those times when, in fact, there is no.l

CHAIR CORRADINI: For some.

MEMBER STETKAR: There is none for any of them. The only argument you might make is the ancillary diesels.

CHAIR CORRADINI: I will look at the applicant.

MEMBER STETKAR: Now, Rick might be able to find other examples where there might be but, for example, if there is no unavailability due to maintenance whatsoever in the risk assessment, then it's presumed that equipment is never unavailable so its unavailability due to maintenance is precisely zero. You can't tell me that seven days is bounded by zero.

MR. CARUSO: No, and --

MEMBER STETKAR: I'm bounded by an assumption of no unavailability. A lot of my problem is this sense that the Availability Control Manual, the list of equipment in -- I'm not arguing with the list of equipment. I'm arguing the bit about the allowed outage times but they are not allowed. The times that are in there are somehow justified by the fact that the PRA provides technical justification for those times. That's what I'm arguing with. Let's just admit and be up front that they're arbitrary and the maintenance rules provides some protection for us that the risk of the plant is going to be managed.

MR. CARUSO: If I were building the PRA for the plant that's going to --

MEMBER STETKAR: Right.

MR. CARUSO: -- I'd be out of this. The Availability Control Manual might be the way to say, "Hey, you know, do I have an availability in for this? I have nothing in there and then I got this thing that is giving me an idea of what's reasonable.

Maybe I should put that in. Maybe it could be worked the other way around.

MEMBER STETKAR: But the fact of the matter is what was done was done and --

MR. CARUSO: That was never done.

MEMBER STETKAR: Is does not violate any --

MS. CUBBAGE: I would just like to take a step back at why we are even talking about availability controls. I mean, all the safety-related systems are being handled in a manner appropriate with safety regulations. Then we have tech specs that are in accordance with the requirements of 1536 and now we've taken the non-safety systems and we have invented this RTNSS process because there was anxiety about having these non-safety systems that had some importance. The RTNSS policy basically was to try to impose some regulatory oversight to ensure that these systems would be reliable and available when called upon. The ACM is not a specific requirement. It's a proposal that the applicant has put forth consistent with previous passive plants to provide assurance of availability. I think what you're hearing is the logic process that the staff went through in determining what these ACMs should look like. Should they look like a tech spec. We acknowledge your comments and --

MEMBER STETKAR: I think that process -- I'm not arguing. I have no problem. I think it's a wonderful process. The only thing that I'm arguing -- I'm raising a concern about is the staff providing written justification that essentially these times are reasonable because they are bounded by something in in the PRA when that thing is not even in the PRA.

MS. CUBBAGE: We acknowledge your comment.

MEMBER STETKAR: So be careful about that because you are raising the PRA essentially to a level of technical support which indeed it cannot actually meet.

MS. CUBBAGE: Right. We acknowledge your comment.

MEMBER STETKAR: There is nothing wrong with that but we can't meet that at this stage.

MS. CUBBAGE: Right. I also point out that in the absence of the ACM you would just have maintenance rule and the operating plants only have maintenance rule.

MEMBER STETKAR: Right.

MS. CUBBAGE: And the active plants only have maintenance rule to provide availability controls for non-safety systems that have importance, perhaps more importance than some of these RTNSS systems.

MR. CARUSO: I think in this case in our time to make as much sense as we could out of it and logic out of it was to say kind of like the expert panel in the PRA. When you have some qualitative information you use it to help you guide you in what you should put here. When you don't, you know, you don't and you do the best you can.

CHAIR CORRADINI: Did you want to say something?

MR. WACHOWIAK: This is Rick Wachowiak. I just wanted to make one comment. I don't know that I would have used the word arbitrary. That seems like --

MEMBER STETKAR: It's provocative.

MR. WACHOWIAK: -- either too strong or too weak of a word.

MEMBER STETKAR: It's provocative.

MR. WACHOWIAK: It's a provocative word. It's consistent with the reason why things got into the ACM in the first place which is based on the way the PRA is put together. For example, not having the one diesel as we explained, why that works out, that is consistent with what's in the PRA and consistent with the way that the PRA was manipulated to give you the list of RTNSS equipment, whether we put it in versus keep it out. We wouldn't want to say that something in the PRA told you that it should be 14 days or 13.5 days or something like that. That's probably like knowing the wattage on a battery down to the third, fourth, fifth decimal place.

MEMBER STETKAR: I understand that, Rick, and I understand what you did. I know and I'm not arguing at all about 14 days or seven days or three days or whatever. I am concerned that people are justifying and, in particular, the staff is justifying that by making statements like, "It's okay because it's bounded by what is in the PRA."

MEMBER ARMIJO: So if those words were just taken out you would be happy?

MEMBER STETKAR: Yes.

CHAIR CORRADINI: That's what I sensed.

MEMBER ARMIJO: The other thing is I want to make sure I understood John. You're not saying that maybe in the ideal world they would be bounded by the PRA in the ideal world.

MEMBER STETKAR: That's a different world.

MEMBER ARMIJO: But it isn't our world.

MEMBER STETKAR: That's an ideal world that may never occur.

MEMBER ARMIJO: It may never occur. I don't think John is arguing that he should be. Just don't make the claim.

MEMBER STETKAR: In risk-informed tech spec space that ideal world is brought to fruition. Whether there are ever any risk-informed ACLCOs who know but the fact the matter is we are far from that world right now.

CHAIR CORRADINI: Okay. On that note, I'm going to move us along.

Mark, do you have anything else to say?

MR. CARUSO: Not on this chapter.

CHAIR CORRADINI: Okay. Do we have anymore questions for the Committee?

MEMBER STETKAR: Yes.

CHAIR CORRADINI: You have another one?

MEMBER STETKAR: Yes, I do.

CHAIR CORRADINI: Okay.

MEMBER STETKAR: To get an idea about some of this stuff, you did have questions about one part of the process that triggers something into the RTNSS list that we really didn't talk about and that is something could be important to an initiating even frequency. There was some questioning from the staff about loss of preferred power.

MR. CARUSO: Yes.

MEMBER STETKAR: And the conclusion for that was -- I was going to ask GEH but I got moved along there and I'm going to stop the process of moving me along. The statement was made that grid-related and weather related faults, the external grid and faults that are caused by weather, are certainly beyond the control of the plant operator and that contributions to the loss of preferred power from either switchyard related events or implant faults, which are in principle under the control of the plant operator, are insignificant, do not significantly affect the initiating event frequency. That's a statement. The SER just basically repeats that.

I dutifully went back and looked at data and all the data that I can find says that switch-yard related and plant-centered events are a heck of a lot more important than weather-related events and they may be more important than gird-related events, certainly during shutdown modes so I was curious about that justification or maybe where the data came from to show that grid-related and weather-related events are by far the predominant cause for loss of preferred power. By implication then nothing under the COL applicant's control or the design would contribute.

MR. CARUSO: I think that Marie Pohida came to the same conclusion you did and found the same indicator that you did about this. We went back at the 11th hour and looked at what was the rationale for this here. We went back through whether or not this initiating event, you know, looked at those three questions about whether or not it should precipitate RTNSS equipment. We factored in the fact that this stuff does initiate events. I think we changed the write-up as to -- I can't tell you exactly how it came out but it did come up and we did resolve the issue. I don't know if you remember, Rick. I should be in our SER.

MEMBER STETKAR: In the SER what it says is, "In DCD Tier 2 Rev. 7 Section 19A4.3 the applicant stated that the dominant risk contributions in the loss of preferred power event category are from the loss of incoming AC power from the utility grid and weather related faults.

These faults result from the failure of components that are not controlled by the site organization. Non-safety related SSCs controlled by the site organization such as substations, breakers, motor control centers and protective relays do not significant affect the initiating event frequency.

In addition, the applicant noted that a non-safety related emergency AC power system designed to mitigate the effects of a loss of preferred power, i.e., STGs and PIP busses, has RTNSS controls based on other criteria."

It basically says that because the diesels are in there you don't need to worry about -- if the loss of off-site power frequency was once per year and it was all due to the switchyard failures you wouldn't worry about it.

MR. WACHOWIAK: This is Rick again. When we said that it doesn't significantly affect the initiating frequency, I think what we were saying there is it doesn't meet the definition for significance for an initiating event frequency and that is defining that section. Okay.

MEMBER STETKAR: It's a different statement than what's in here.

MR. WACHOWIAK: The way we addressed the

particular RAI that you were talking about, Mark, was it was unclear for shutdown whether that applied, the at-power statement that we had that said something similar to that. We determined that it did and copied it into the shutdown section so we didn't change that. We just put it every place that it applied.

MEMBER STETKAR: The key is in the RAI response is that it doesn't trigger the criteria for RTNSS.

MR. WACHOWIAK: It doesn't trigger the criteria for RTNSS. That's correct.

MEMBER STETKAR: That's fine. I didn't know whether the staff's determination was based on the statement that those particular causes were insignificant to the overall initiating even frequency which is what I got out of this.

MR. WACHOWIAK: No. It's a fraction of the initiating event frequency but it's not a large enough fraction so that piece in itself would meet the RTNSS threshold.

MR. CARUSO: At shutdown the landscape changes.

MEMBER STETKAR: It can be on the order of about 80 percent event frequency so that essentially means the whole initiating event frequency had better be below the RTNSS.

MR. WACHOWIAK: I would like to see the report that you're talking about and we can compare that to the one that is used for generating initiating events as well. That whole topic has been evolving.

MEMBER STETKAR: Look up just for reference NUREG/CR-6890, Table 3-1. It gives you data from 1997 through 2004. Table 3-5 picks up data in 1986 through 1996.

CHAIR CORRADINI: So that's for the record but you guys will converse after, right?

MR. WACHOWIAK: I thought that was what we --

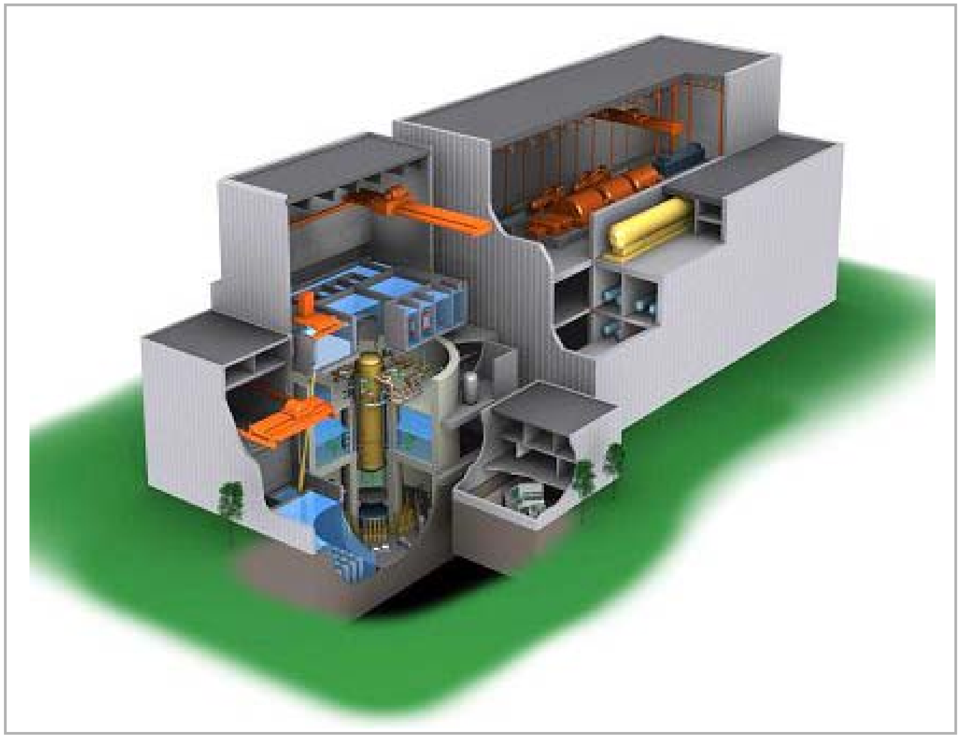
CHAIR CORRADINI: Other questions?

Okay. At this point we'll take a break and we'll take a little bit longer break. We'll convene right on time at 3:15 because we've got to clear the room -- well, we'll come back at 3:15 and bridgeline will be closed. All the members will leave their various appliances in the back because all cell phones will be confiscated.

(Whereupon, at 2:48 p.m. the open session was adjourned.)

GE Hitachi Nuclear Energy

ESBWR Chapter 5: Reactor Coolant System and Connected Systems



Advisory Committee on Reactor Safeguards

Tim Enfinger

Jerry Deaver

June 22, 2010

HITACHI

Introduction

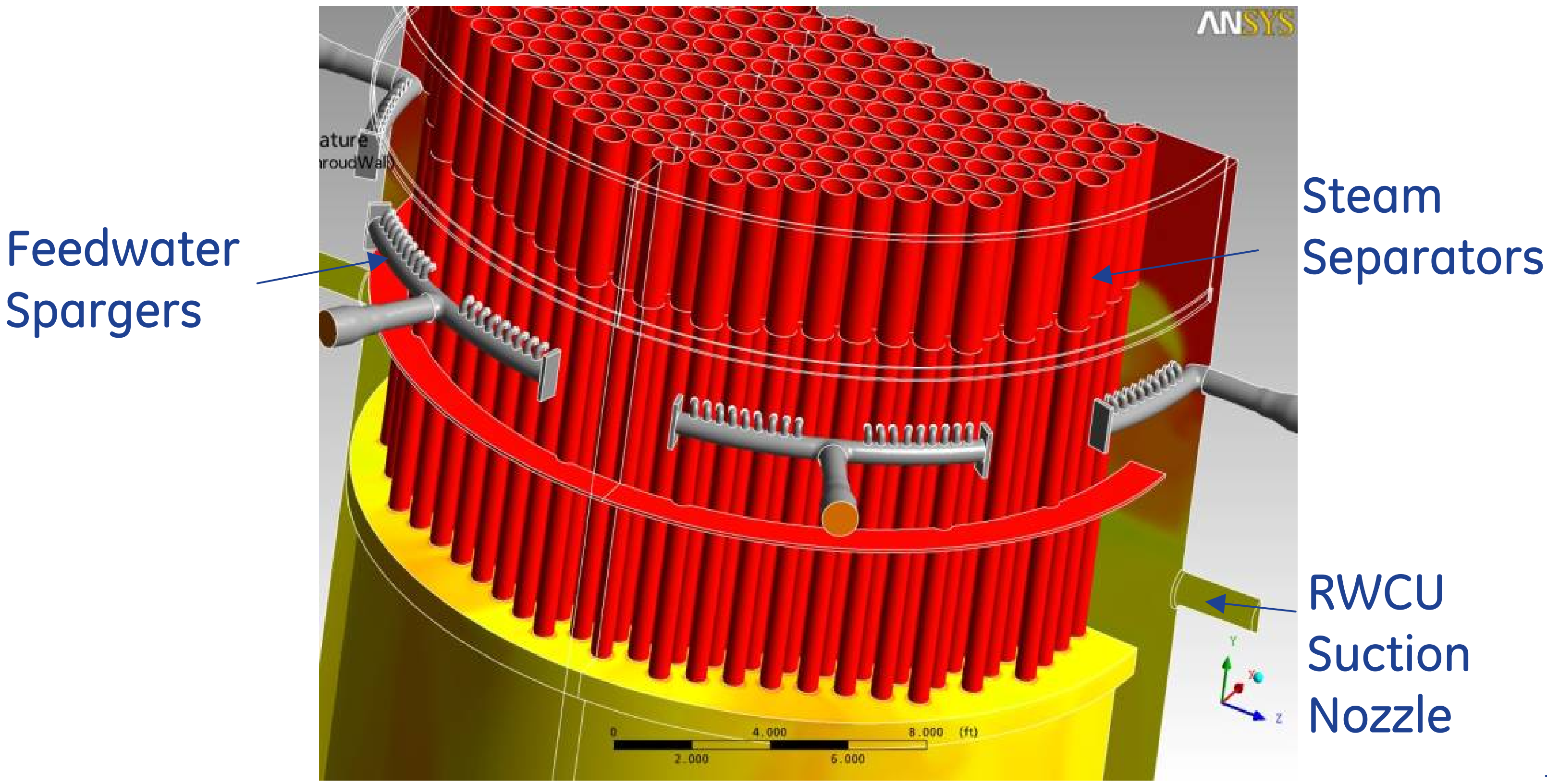
- **Open items from the 2007 SER with Open Items**
  - 26 open items identified in the SER; all resolved
  - Most significant is Open Item 5.4-59
- **Open items of interest from 2007 ACRS chapter 5 meetings**
  - RAI 5.2-70 IASCC effects on reactor internals
  - RAI 5.2-71 & -71 S01; Welding & Grinding on RCPB components
- **Other item of interest**
  - ASME Code Case N-782; applicable ASME Code Edition

HITACHI

Open Issue 5.4-59

Summary from SER:

Provide additional information regarding operation of the reactor water cleanup/shutdown cooling (RWCU/SDC) system during Modes 5 (cold shutdown) and 6 (refueling).



RAI 5.4-59 Decay Heat Removal (DHR)

Response:

a) Clarified vertical separation of feedwater (return flow) and mid-vessel (supply flow) nozzles and SDC flow path

b) Clarified DCD discussion of vessel level for SDC function
   - Addresses ESBWR design relative to SIL-357 recommendations
   - Discusses transition between Modes, thermal stratification, and design to limit thermal cyclic fatigue.

c) Results of RWCU/SDC DHR performance analysis provided
   - Described analytical model for Modes 4 & 5 DHR evaluation
   - Addressed sensitivity of mixing function value to SDC flow rate and cool down time

d) Clarified information from the shutdown PRA

RAI 5.4-59 DHR (continued)

Conclusion

- Changes resulting from this RAI were incorporated in DCD Revision 6, no additional changes afterward
- Analytically shown to be tolerant of incomplete return flow mixing with respect to cool down time
- Design strategy mitigates cyclic thermal fatigue
- The design permits passive response to mitigate a loss of shutdown cooling

HITACHI

RAI 5.2-70

Summary of RAI:

1. Explain/expand DCD statement to include your plan of mitigating the IGSCC and IASCC of the core shroud
2. Revise the DCD and discuss other mitigating device(s) that you will be using in addressing the IGSCC and IASCC of the core shroud

Response:

DCD subsection 5.2.3.2.2 was modified to acknowledge that IASCC becomes a concern when fluence reaches 5×10^{20} n/cm^2, and that material hardening and segregation occur. Improvements in water chemistry are beneficial to limit susceptibility to both IGSCC and IASCC.

Prevention measures include material selection, fabrication and process controls, water chemistry controls, and locating welds away from high fluence regions. For the shroud, solution annealing following welding will reduce the effects of cold work and weld residual stresses.

Conclusion:

Effective prevention measures have been identified in the DCD that limit the susceptibility to IGSCC and IASCC to components exposed to Rx water

RAI 5.2-71 & -71 S01

Summary of RAI:

The staff requested that GEH make the following DCD modifications:

1. Describe controls placed on welding operations that minimize the potential for welding defects that would require grinding
2. For those situations where grinding is unavoidable, define methods to be taken to minimize the effects of cold work

Response:

DCD subsections 4.5.2.2 & 5.2.3.4.2 were revised to implement welding controls (thorough cleaning of weld preps, use of protective gas back purge, prohibiting SMAW on root pass, visual exam each weld pass)

DCD subsections 4.5.2.2 and 5.2.3.4.2 were revised to identify controls to limit cold work (limits on hardness, bend radii, and surface finish on ground surfaces); and identify methods to mitigate surface cold work (local or full re-solution annealing, flappering, controlled machining, mechanical polishing or electroplating)

Conclusion:

The DCD now provides controls that will minimize weld defects and contains processes to minimize the effects of grinding when it is necessary

ASME Code Case N-782

- Inquiry: What Code Editions, Addenda, and Cases may be used as an alternative to NCA-1140(a)(2)(a) and NCA-1140 (a)(2)(b)?

{NCA-1140(a)(2) In no case shall the code Edition and Addenda date be established in the Design Spec be earlier Than:

(a) 3 years prior to the date that the Nuclear Power Plant construction permit application is docketed; or

(b) the latest edition and addenda endorsed by the regulatory authority having jurisdiction at the plant site at the time the construction permit application is docketed}

- Reply: It is the opinion of the Committee that as an alternative to NCA-1140(a)(2)(a) and NCA-1140 (a)(2)(b), the following requirements may be used:

  (a) **The Edition and Addenda endorsed for a design certified or licensed by the regulatory authority**

  (b) This Case number shall be recorded on the documentation for the item

HITACHI

ASME Code Case N-782 (continued)

- This code case has been incorporated into the ESBWR DCD rev 7 (Table 5.2-1)
- The ASME Code Edition and Addenda will remain the same for all ESBWR plants licensed under the US NRC certification program
- Standardizes the equipment documentation and simplifies closure of ASME related ITAACs
- All ASME code requirements for all applicable equipment will be met

Summary

- All open Chapter 5 items have been resolved
  - Subsection 5.4.6 has been modified as a result of the chapter 6 hydrogen detonation issue
- The design of components exposed to reactor water are now more robust
- In response to operating plant experience, improved fabrication processes and methods are being implemented

Presentation to the ACRS Subcommittee

ESBWR Design Certification Review

Chapter 5 - “Reactor Coolant System and Connected Systems”

Zahira Cruz – Project Manager

Marie Pohida – RAI 5.4-59 Resolution

John Wu – ASME Code Case

June 22, 2010

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 5

Open Item 5.4-59

- To support understanding of shutdown risk, staff requested information on:
  - Minimum vessel level to support RWCU/SDC operation (adequate vessel circulation).
  - Potential for RWCU/SDC flow to bypass the core due to inadequate mixing in the downcomer.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 5

Open Item 5.4-59 (continued)

- In response to staff RAIs, GEH updated DCD to include:
  - Minimum vessel level to support shutdown cooling core circulation.
  - Discussion on prevention of thermal stratification by maintaining vessel level sufficiently above minimum level.
  - Discussion of mixing within the vessel.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 5

<u>Open Item 5.4-59 (continued)</u>

- To confirm DCD updates and GEH's simplified calculation for core temperature response, RES performed 3D CFD calculations on RWCU/SDC flows
  - Geometry extracted from GEH supplied model.
  - Model includes:
    - downcomer region
    - space around separators
    - inlet feedwater spargers
    - lower plenum in detail
  - Downflow from separator spillover interacts with horizontal jets from feed water sparger.
    - spargers physically spread the incoming flow
    - flow interaction with separator geometry and spillover flows results in high turbulence generation and mixing
- RAI 5.4-59 is closed

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 5
Section 5.2.1 – Codes and Applicable Code Cases

Regulations and Regulatory Guidance

- General Design Criteria 1
- 10 CFR 50.55a
- Regulatory Guides 1.84, 1.147 and 1.192

Technical Review Summary

- GEH requested to add ASME Code Case N-782 to DCD Tier 2 Table 5.1-2, Applicable Code Cases, in order for ESBWR to be in compliance with requirements of ASME NCA-1140(a)(2).
- Code Case N-782 is not listed in RG 1.84 for NRC acceptance. The use of this Code Case requires the staff approval.
- The request is approved by the staff based on GEH's provided information in accordance with 10 CFR 50.55a(3)(i) and (3)(ii).

Open Items

- None

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 5

Discussion/Committee Questions

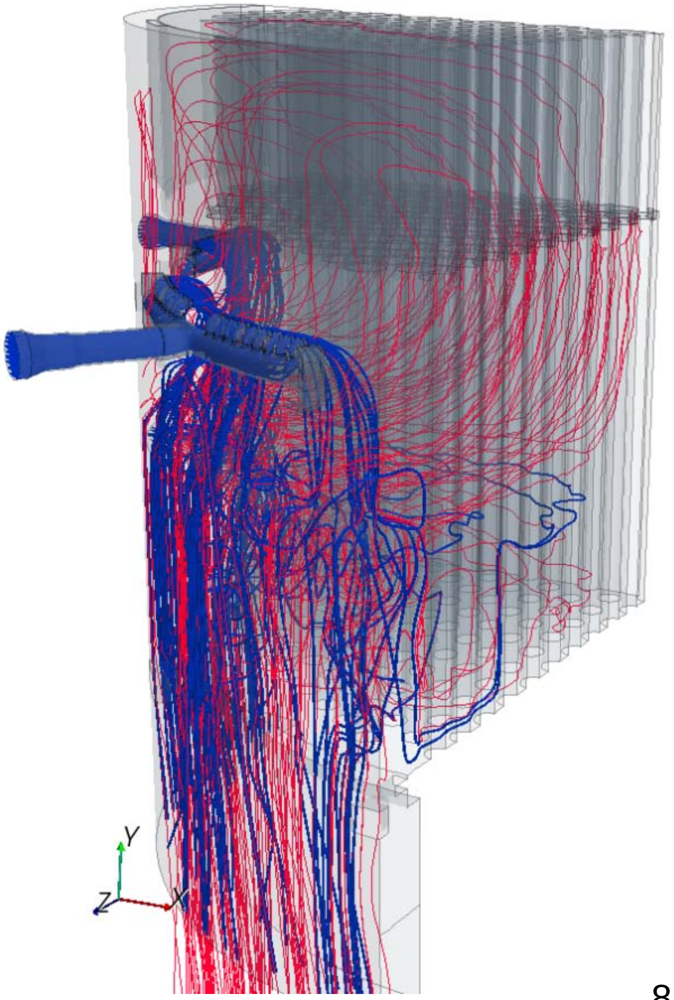
ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 5

Backup Slide

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 5

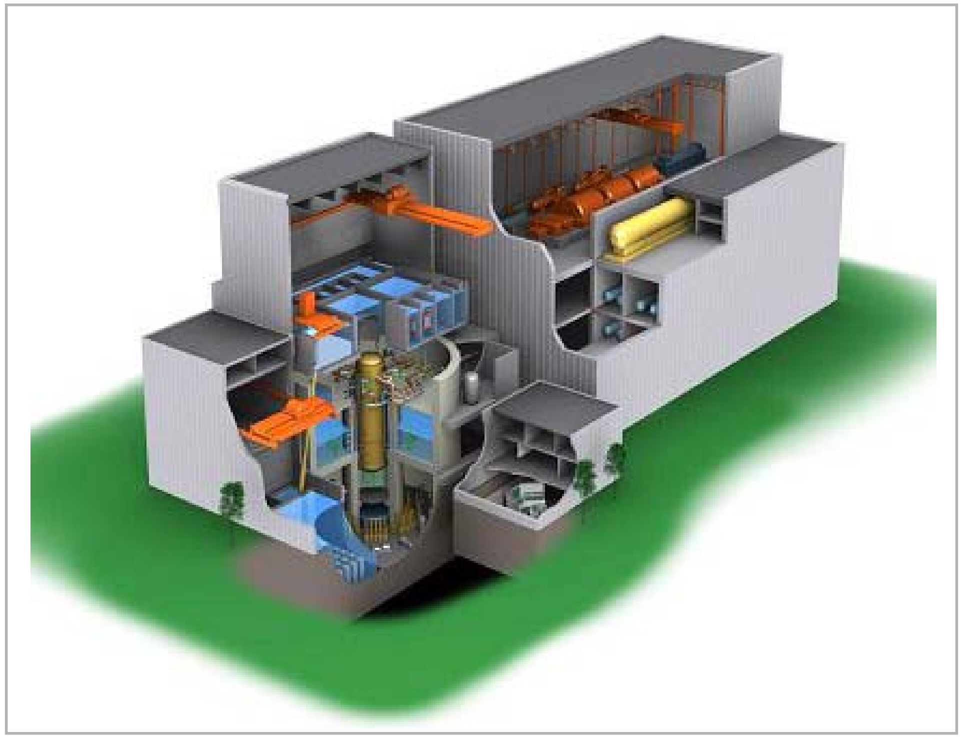
Open Item 5.4-59

- Mass flow from separator spillover (red) is over 10X the mass flow from the spargers (blue) at 8 hrs.
  - The spargers physically spread the incoming flow around the periphery of the vessel.
  - The incoming flow (blue) is swept away by the significantly larger natural circulation flows coming out of the separators (red).
  - Mixing is nearly 100% and bypass is not predicted.



GE Hitachi Nuclear Energy

ESBWR Chapter 8: Electric Power



Advisory Committee on Reactor Safeguards

Rick Wachowiak

June 22, 2010

HITACHI

Introduction

Single open item from SER with Open Items

- Provide battery loading profile for safety-related 250 VDC batteries for 72-hour operation

Other configuration changes included in Advanced Final SER

- Battery type
- Uninterruptible Power Supply (UPS) configuration
- Ancillary Diesel Generators

Open Item 8.3-52 S03

Summary from the SER:
GEH did not provide the loading profile to demonstrate that the safety-related 250 VDC batteries are sized to meet the design requirement of their connected load for the corresponding time period of 72 hours without the charger's support. Therefore, the staff identified this issue as open for the safety-related 250 VDC system.

Response:
GEH generated a loading profile which was summarized in Table 8.3-3 of the DCD. This table documented the estimated nominal safety-related loads for the 250 VDC Safety-Related Batteries. In addition an ITAAC (Table 2.13.3-3 #3) was added to test the as-built batteries to simulate the analyzed battery design duty cycle.

Open Item 8.3-52 S03

<u>Summary from RAI 8.3-52 S04:</u>

The staff requested additional information related to the GEH response to S03 including battery capacity, charger and rectifier specifications, inverter specifications related to total harmonic distortion and regulating transformer and UPS requirements.

<u>Response:</u>

Table 8.3-4, *Safety-Related DC and UPS Nominal Component Data*, was added to DCD Rev 6 to address these concerns.

<u>Conclusion:</u>

The battery capacity, charger sizing, and inverter sizing are consistent with the DC load profile.

250 VDC Safety-Related Battery Nominal Load Requirements

	DC Power (Watts)							
	Normal	DBA 0-1 min	1-5 min	5-7 min	7-15 min	15-17 min	17-60 min	1-72 hours
Division 1	24697	26259	19618	22118	20501	20618	20501	20501
Division 2	24697	26259	19618	22118	20501	20618	20501	20501
Division 3	22040	23604	23993	26180	24563	24680	24563	24563
Division 4	22040	23604	23993	25805	24188	24305	24188	24188

Calculation Performed To IEEE 485 - 1997

HITACHI

ESBWR Safety Related Battery Type

Changed VRLA to VLA Batteries:

- In 2008, IEEE 535 committee had no plans to incorporate VRLA
- GEH conducted several month exploration of the two technologies
  - Examined four different suppliers with both offerings
  - Evaluation matrix created to aid in selection
  - VLA ranked highest
- Customers expressed concern with VRLA batteries
  - High comfort level with VLA and no experience with VRLA
  - Concerned about lack of regulatory guidance
- DCD rev 6 switched from VRLA to VLA batteries
- Battery qualification is described in NEDE-33516P

HITACHI

ESBWR Uninterruptible Power Supply (UPS)

Safety-related loads are supplied by the UPS

- Not directly from the battery

Each UPS consists of a rectifier and an inverter

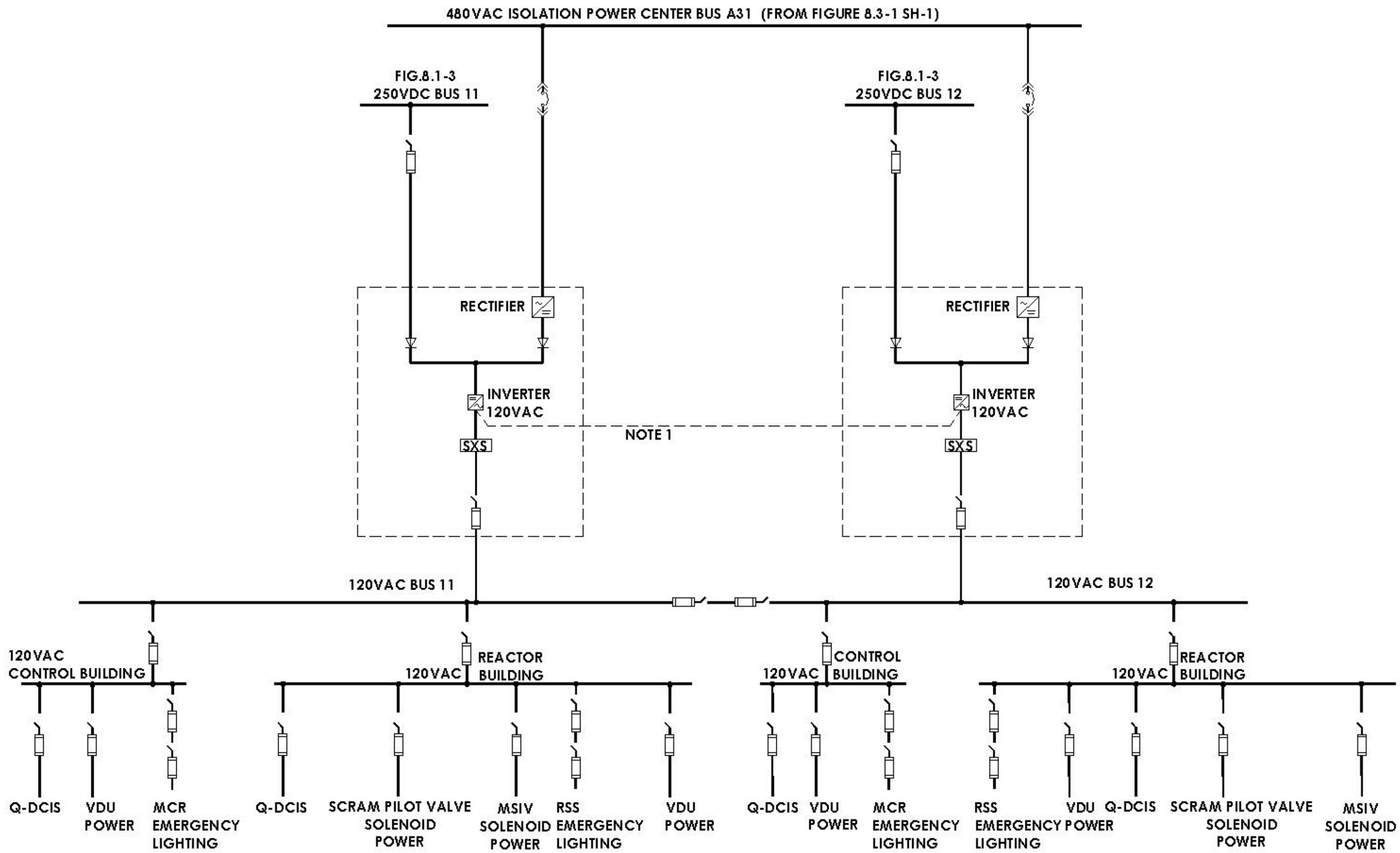
- Two in each division
- Each UPS normally carries 50% of the load

Normal power to UPS is from Isolation Power Center bus

Standby power is 250 volt dc from batteries

No safety-related UPS bypass transformers to preclude the potential for disruptive voltages and frequencies to reach safety-related loads

250 VDC / UPS Configuration



SAFETY-RELATED UNINTERRUPTIBLE POWER SUPPLY DIVISION 1

HITACHI

Ancillary Diesel Generators (ADG)

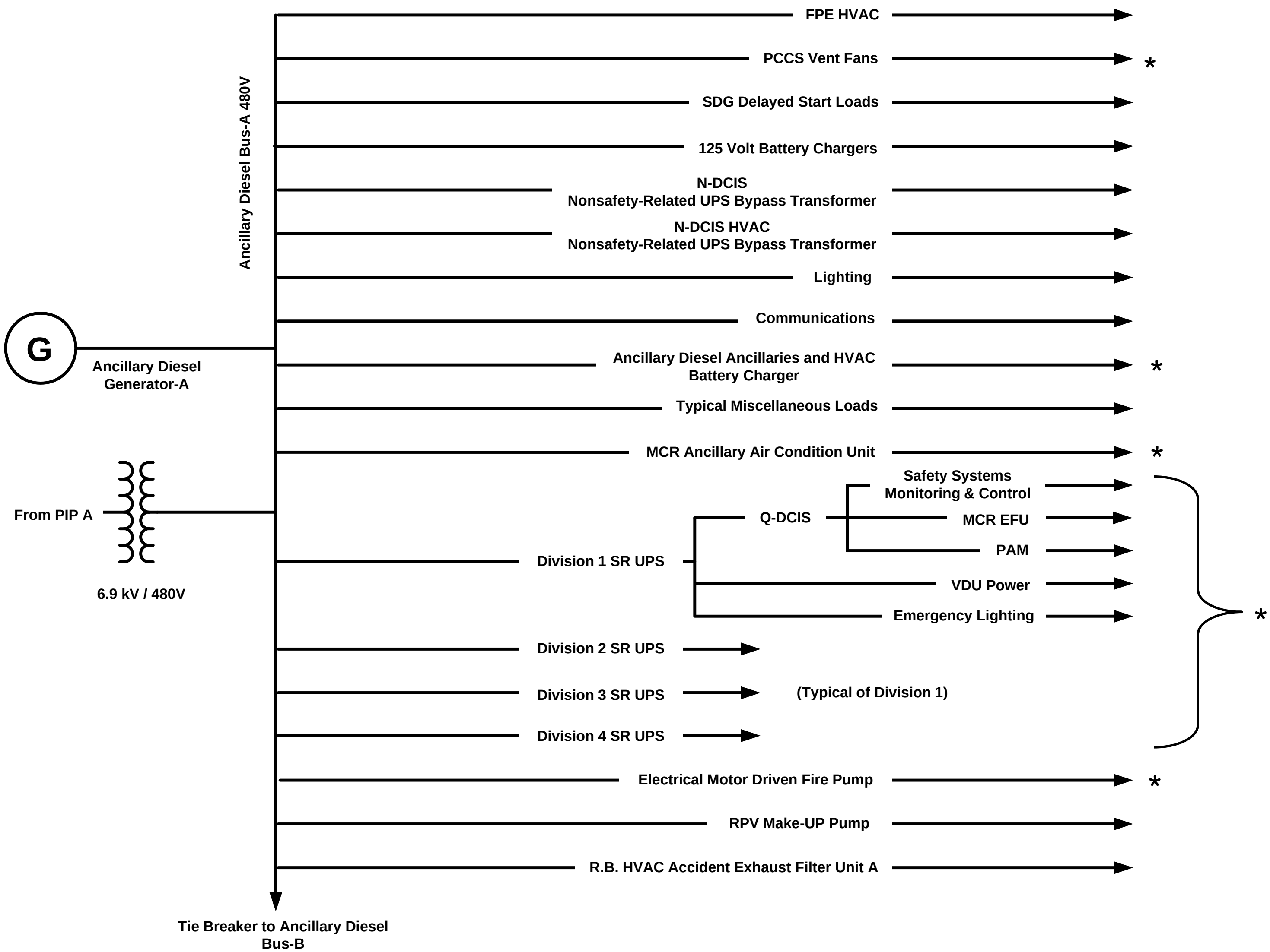
Redundant ADGs provide 480 volt ac power post-72-hours

ADGs and support SSCs are seismic Category II and housed in a seismic Category II structure

Not credited in any design basis analysis for first 72 hours following the loss of all other ac power sources

Automatically start on low voltage or low room temperature

ADG Bus Configuration



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* Required for RTNSS B

Summary

All open items related to the 250 VDC electrical system are closed and the system meets the regulatory requirements and associated acceptance criteria

GE HITACHI

United States Nuclear Regulatory Commission
Protecting People and the Environment

Presentation to the ACRS ESBWR Subcommittee

Advanced Final SER for Chapter 8 Electrical Power

Amar Pal – Technical Reviewer
Dennis Galvin – Project Manager

June 22, 2010

ESBWR-CHAPTER 8

- SER with Open Items briefed on October 3, 2007 based on DCD Revision 3
- Discussion
  - Open Item since last meeting with ACRS
    - Load Profile and Battery Sizing
  - Batteries
  - Uninterruptible Power Supply (UPS)
  - Ancillary Diesel Generators
  - Conclusion

ESBWR-CHAPTER 8

- One open item in the SER with Open items.
  - RAI 8.3-52 involved battery sizing
  - Battery Load Profile is provided in DCD
  - GEH provided a summary of the battery sizing calculation.
  - IEEE 485 is used to size the battery (aging factor, temperature correction factor based on lowest electrolyte temperature, margin, battery state of charge factor).
  - RAI 8.3-52 was resolved

ESBWR-CHAPTER 8

- Batteries
  - Batteries were changed from valve regulated lead acid (VRLA) to vented lead acid (VLA) in DCD Revision 6.
  - VLA batteries are used in existing nuclear power plants.
  - Batteries are adequately sized to mitigate accident without charger support for 72 hours.
  - Battery qualification will be demonstrated by type testing per licensing topical report NEDE-33516P.

ESBWR-CHAPTER 8

- Uninterruptible Power Supply (UPS)
  - In the ESBWR, all safety-related load are provided by the UPS
  - UPS consists of a rectifier and an inverter
  - Each division has two UPSs and each UPS normally carry 50% of the load
  - Normal power to UPS is 480 volt from isolation power center (IPC) bus and standby power is 250 volt dc from batteries.

ESBWR –Chapter 8

- Staff was concerned about the effect of voltage transients during islanding mode of operation (RAI 8.2-14).
  - The design includes trip coordination (magnitude and time delay) among input rectifiers, battery chargers, and inverters, so that rectifiers and battery chargers trip first on excessive high voltage so that inverters continue to supply safety-related loads using stored energy from batteries.
  - An ITAAC is provided to verify the trip coordination of safety-related battery chargers and UPS input rectifiers with inverters.
  - ESBWR design has been changed to eliminate the safety-related UPS bypass transformers because of potential for disruptive voltages and frequencies to reach safety-related loads.
  - RAI 8.2-14 was resolved.

ESBWR-CHAPTER 8

- Ancillary Diesel Generators (ADG)
  - ADGs added in DCD Revision 4
  - Two ADGs provide 480 volt ac power to meet post-72-hour power requirements.
  - ADGs and auxiliaries, controls, electrical distribution buses, and fuel tanks are seismic Category II and housed in a seismic Category II structure.
  - ADGs are not required to support safety-related loads for the first 72 hours following the loss of all other ac power sources.
  - An undervoltage condition on ancillary diesel buses or a low ancillary diesel room temperature will start ADG.

ESBWR –Chapter 8

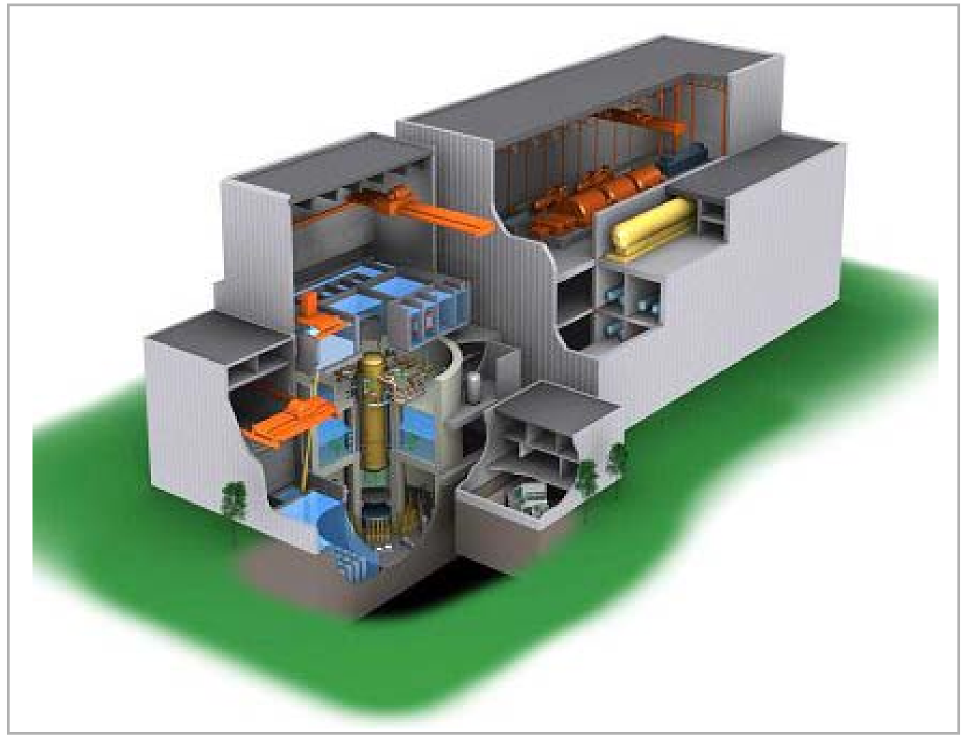
- Ancillary Diesel Generators (Cont'd)
  - ADGs are part of RTNSS program.
  - The availability controls manual requires that two ADGs with fuel tanks, fuel oil transfer pumps and ancillary buses be available during all modes of plant operation.
  - ADGs are started and operated at rated load for one hour every 92 days.
  - ADGs are load tested at rated load for 24 hours every refueling outage.

ESBWR-CHAPTER 8

- Conclusion
  - The applicant has provided sufficient information to demonstrate that the offsite power supply system, onsite ac power supply systems, and onsite dc power supply systems are capable of providing power to support the plant's safe operation satisfying the requirements of GDC 17 and 18 . Additionally, the staff concludes that the ESBWR design is in compliance with 10 CFR 50.63 as they relate to the capability to achieve and maintain hot shutdown in the event of an SBO.

GE Hitachi Nuclear Energy

ESBWR Chapter 11: Radioactive Waste Management



Advisory Committee on Reactor Safeguards

Tim Enfinger

James Cascone

June 22, 2010

GE HITACHI

Brief Timeline of DCD Chapter 11

- Revision 3 (Feb 2007) – No P&IDs and Systems Considered Mobile/Conceptual
- Revision 4 (Sept 2007) – P&IDs included, Systems still considered Mobile/Conceptual
- Revision 5 (May 2008) – P&IDs remain, Systems considered permanent and final

Open items from the 2007 SER

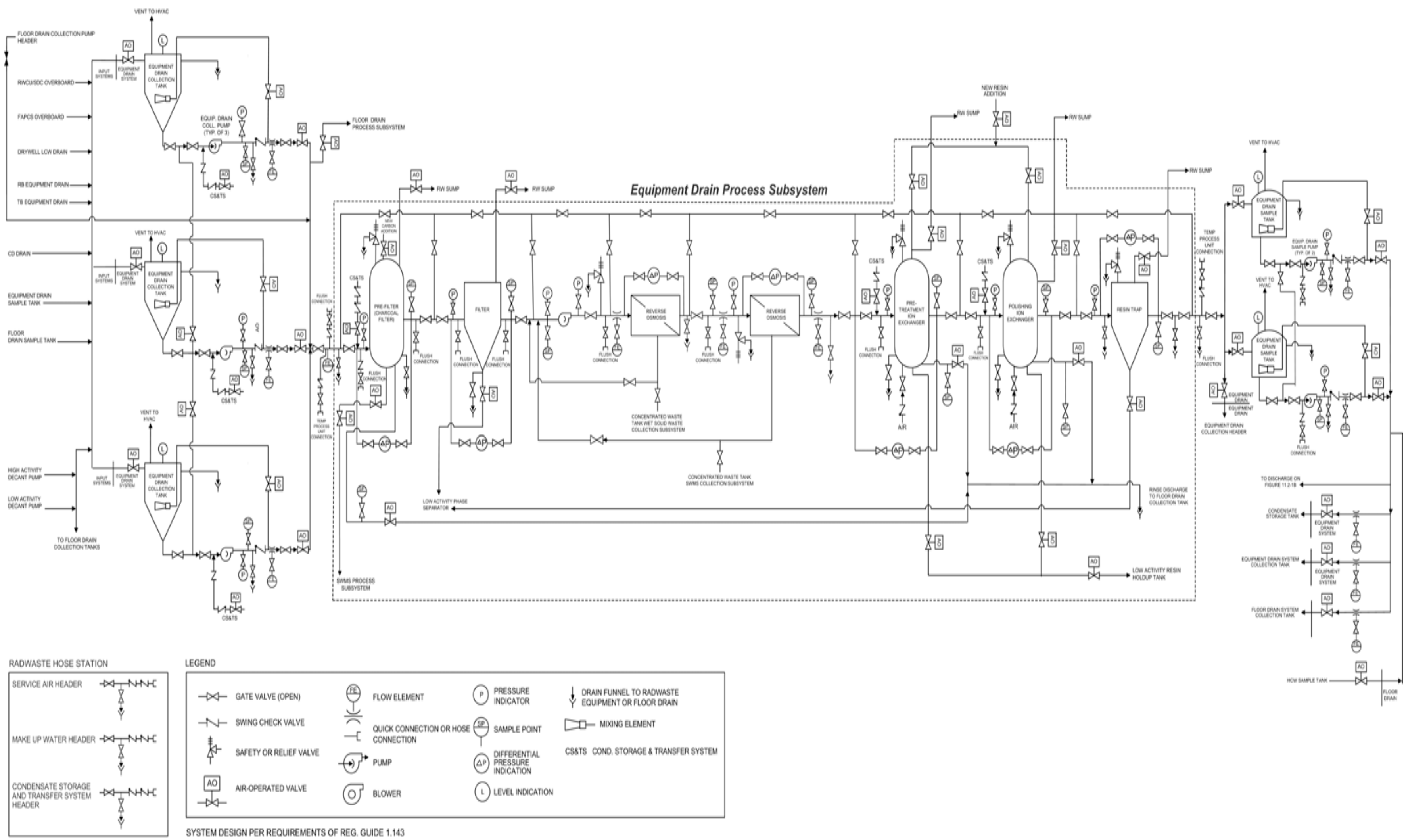
- Three open items identified in the 2007 SER with Open Items; all resolved.
- Most significant Open Items were RAIs 11.2-16 & 11.4-18. (Same issue for LWMS & SWMS respectively)
- Third Open Item was RAI 11.4-15. It required including ITAACs for the SWMS into Tier 1.

DCD Subsections and Figures Affected by RAIs 11.2-16 & 11.4-18

- As a result of RAI 11.2-16, DCD Subsections 11.2.2.2 and 11.2.2.3 and Figures 11.2-1a, 1b, 3 and 4 were revised accordingly.
- As a result of RAI 11.4-18, DCD Subsections 11.4.2.2 and 11.4.2.3 and Figures 11.4-2 and 11.4-3 were revised accordingly.

HITACHI

Typical P&ID (Figure 11.2-1a)



HITACHI

Figure 11.2-1a (Collection Tanks)

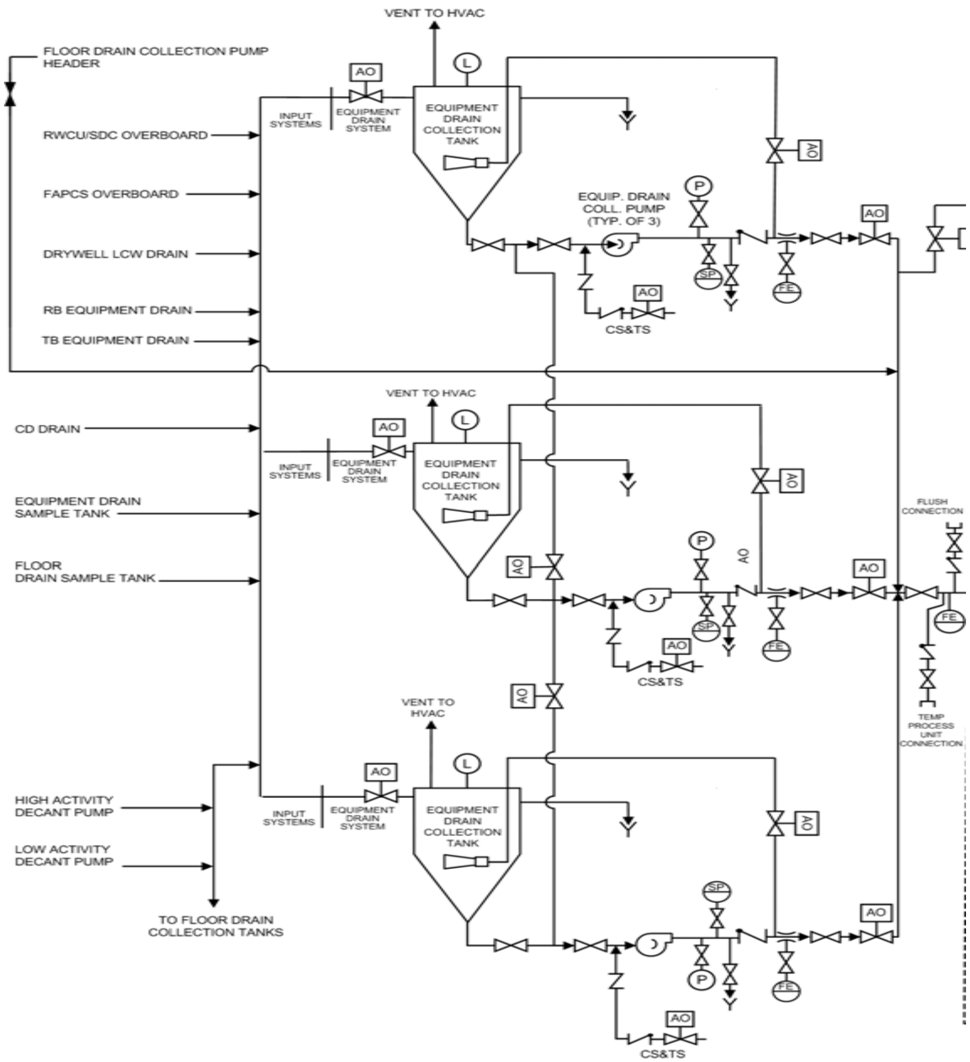
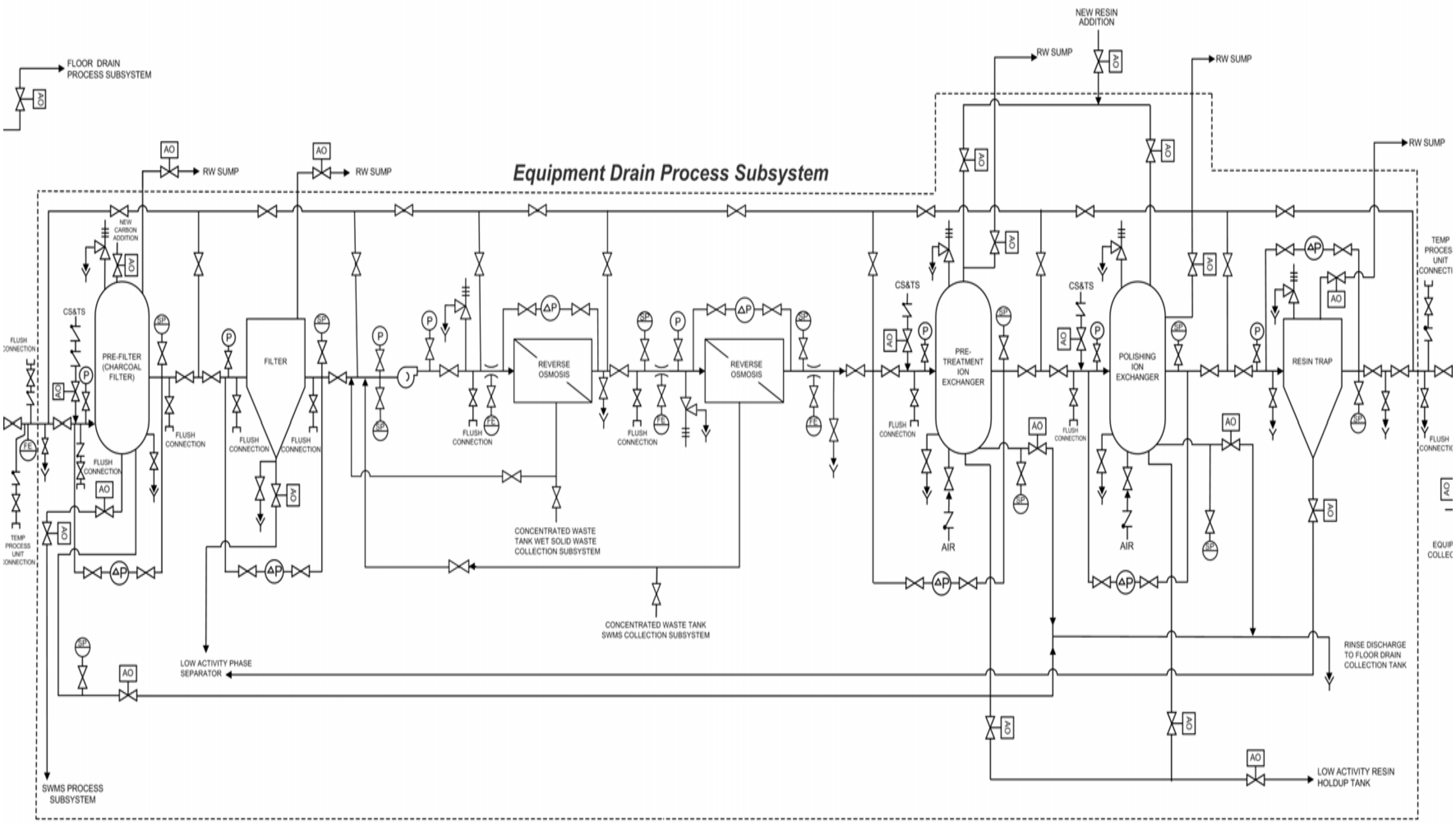
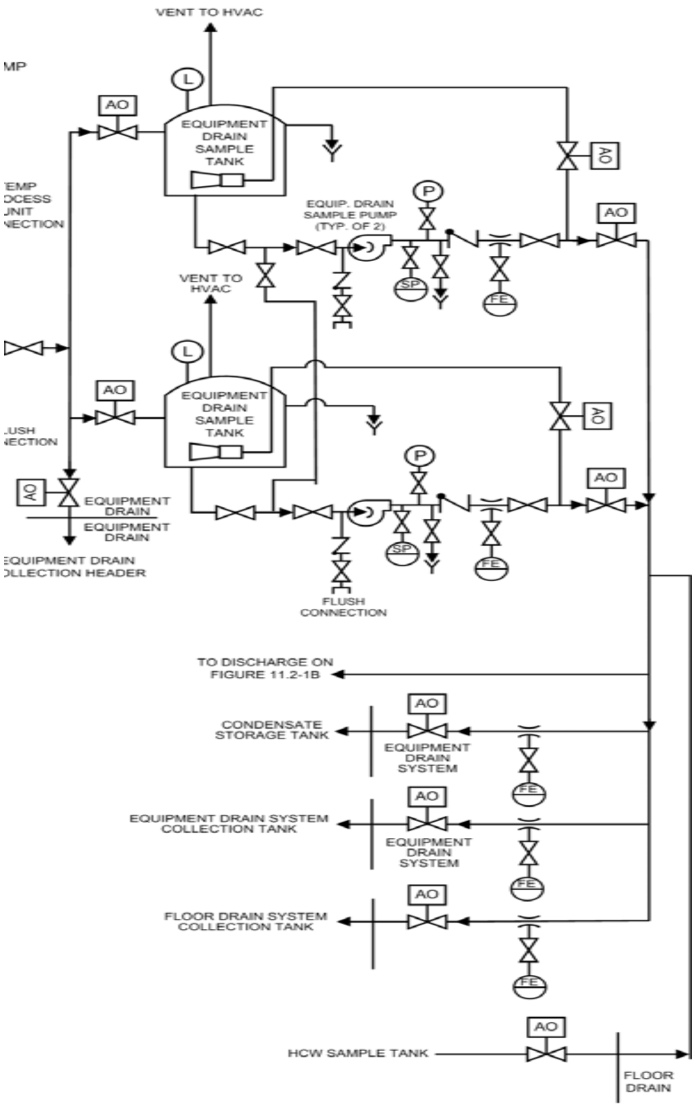


Figure 11.2-1a (Processing Train)



HITACHI

Figure 11.2-1a (Sample Tanks)



Summary

- Collection and Sample Tanks and Pumps are located on the lower elevation of the Radwaste Building (as these components will be required regardless of the type of processing)
- Processing equipment is modular and is located on the grade elevation of the Radwaste Building
  - Area is served with the Radwaste Building crane to allow for reconfiguration or replacement

Presentation to the ACRS Subcommittee

ESBWR Design Certification Review
Chapter 11
"Radioactive Waste Management"

June 22, 2010

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 11

Purpose

- Brief the Subcommittee on the staff's review of open items for Chapter 11 of the ESBWR DCD application, resolved since last presentation
- Review and closure of open items based on applicant DCD Rev. 7 and RAI responses received from applicant.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 11

Project and Technical Review Team

- Lead PM
  - David Misenheimer, Project Manager
- Lead Tech. Reviewers
  - George R Cicotte, Sr. Health Physicist
  - Jean-Claude Dehmel, Sr. Health Physicist
  - Chang Li, Sr. Reactor Systems Engineer
  - Hulbert Li, Electronics Engineer

ACRS Subcommittee Presentation ESBWR Design Certification Review Chapter 11

SER Open Item in 11.2, Liquid Waste Management Systems

- Remaining RAI/Open Item 11.2-16 closed after confirming Rev 4 and 5 updates to DCD
  - Issue: augmentation of information on original design description and configuration - mobile systems
  - Resolution: revised DCD
    - Design relies on permanently installed systems
    - P&ID and description augmented
    - One COL Information Item, contamination minimization
  - No remaining open items in 11.2

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 11

SER Open Item in 11.4, Solid Waste Management Systems

- Open Items (2) closed after confirming Rev 4 and 5 updates to DCD on ITAAC
  - Issue 1: (Open Item 11.4-18) original design description and configuration relied on mobile systems, similar to Open Item 11.2-16
  - Resolution: DCD scope amended
    - Revised design relies on permanently installed systems, P&ID/system descriptions augmented

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 11

SER Open Item in 11.4, Solid Waste Management Systems (cont'd)

- Issue 2: (Open Item 11.4-15) ITAAC consistency with system description changes
- Resolution: DCD revised to amend ITAAC
  - Changes in ITAAC amended to address change from mobile to permanent systems
  - System descriptions/functions augmented to further develop functional description
  - COL Information Items amended/consolidated as 5 items versus previous 12, consistent with other DCD 11.4 revisions
- No remaining open items in 11.4

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 11

<u>Discussion/Committee Questions</u>

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 11

Key Regulations and Review Guidance

- Part 50.34a, 50.36a, & 50.34(f)(2)
- Part 50, Appendix I Design Objectives
- Part 52.47(b)(1) and 52.80(a)
- Part 20.1301, 20.1302, 20.1406, & Appendix B to Part 20
- Part 50, Appendix A, GDC 3, 60, 61, 63, & 64
- Primary SRP Sections: 11.1, 11.2, 11.3, 11.4, & 11.5
- SRP Section Interface: 2.3, 2.4, 3.2 - 3.7, 3.8, 7.5, 9.2, 9.3, 9.4, 9.5, 10.4, 12.2.2, 13, 14, 16, & 17
- Regulatory Guides 1.11, 1.21, 1.33, 1.52, 1.97, 1.109, 1.110, 1.111, 1.112, 1.113, 1.140, 1.143, 4.15, 8.8, & 8.10
- Industry Standards: AISI, ANS, ANSI, API, ASME, ASTM, NFPA, & TEMA

GE Hitachi Nuclear Energy

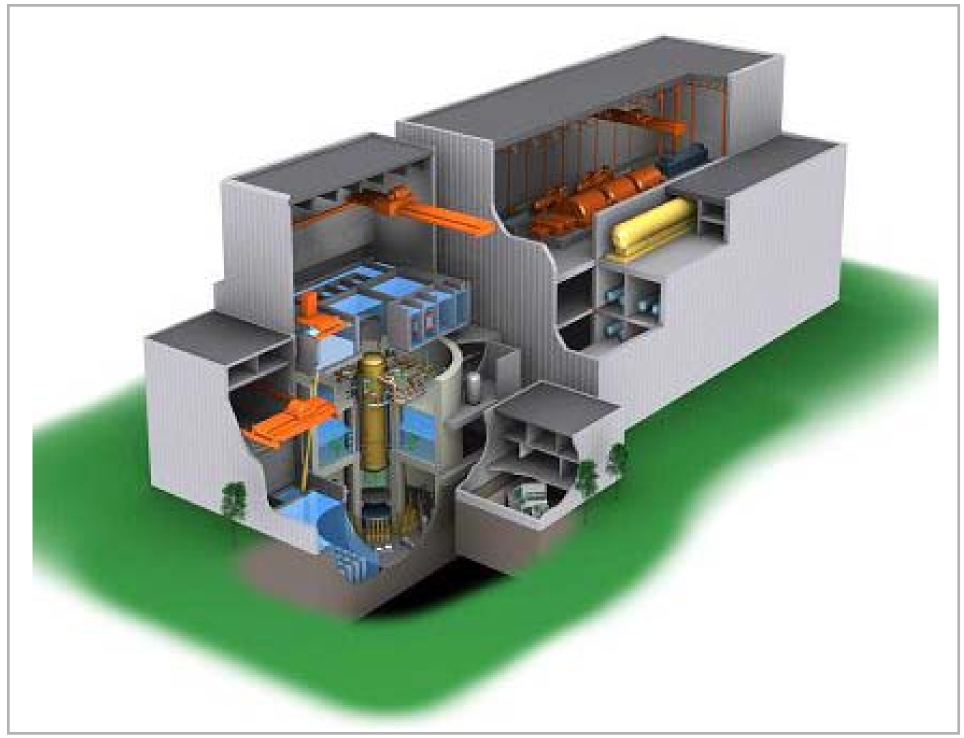
ESBWR Section 17.4: Reliability Assurance Program During Design Phase

Advisory Committee on Reactor Safeguards

Gary Miller

Lee Dougherty

June 22, 2010



HITACHI

Introduction

Open Item from the 2007 SER With Open Items:

17.4-1 List of SSCs within the scope of Design Reliability Assurance Program

Open Item 17.4-1

<u>Summary from SER:</u>
In response to RAI 17.4-1, GEH stated that it will identify a comprehensive list of SSCs within the scope of Design Reliability Assurance Program (D-RAP) at a later phase of development of the D-RAP.

GEH is requested to provide a comprehensive list of SSCs within the scope of D-RAP to the NRC staff so that the NRC staff can complete its review of the ESBWR D-RAP.

Response to Open Item 17.4-1

Response:

SSCs in the scope of D-RAP for ESBWR design certification:

- RTNSS SSCs, and
- Risk-Significant SSCs, as identified in NEDO-33411, "Risk Significance of Structures, Systems and Components For the Design Phase of the ESBWR."
  - NEDO-33411, Revision 2 has been submitted to the NRC.

Response to Open Item 17.4-1, continued

RTNSS SSCs are addressed in DCD Appendix 19A (SER Chapter 22)

Risk-Significant SSC identification methodology

- PRA basic event Risk Ranking Criteria
  - Fussell-Vesely $\geq$ .01
  - Risk Achievement Worth $\geq$ 5 for Individual Components
    $\geq$ 50 for Common Cause Failures
- Seismic Margins Assessment Components that require a High Confidence, Low Probability of Failure to withstand the Safe Shutdown Earthquake

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Response to Open Item 17.4-1, continued

Additional Risk-Significant SSCs:

- RTNSS SSCs meeting Probabilistic Criteria
  - SSCs relied upon to meet NRC Safety Goals
  - SSCs relied upon to meet containment performance goals
- SSCs Identified in an Expert Review Process
  - Operating Experience Review
  - PRA and Severe Accident Insights
  - Integrated Perspective and Cumulative Effects

Conclusion:

GEH has provided a comprehensive list of SSCs in the scope of D-RAP.

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Summary

Open Item 17.4-1 from the 2007 SER has been addressed.

Backup Slide

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Presentation to the ACRS Subcommittee

ESBWR Design Certification Application Review

SER Chapter 17
"Quality Assurance"

June 22, 2010

ESBWR DCD Chapter 17
Staff Review Team

- **Project Managers**
  - Amy Cubbage, Lead PM, DNRL/NGE1
  - David Misenhimer, Chapter PM, DNRL/NGE1
- **Technical Staff Presenters**
  - Todd Hilsmeier, DSRA/SPRA

Summary of Technical Discussion for ESBWR DCD Chapter 17

DCD Section		Summary of Discussion
17.4	Reliability Assurance Program during Design Phase	Discussion of staff's review of the list of systems, structures, and components (SSCs) within the scope of the Reliability Assurance Program (RAP)

Section 17.4 – Reliability Assurance Program During Design Phase

Background

- In October 2007, the staff presented to ACRS Subcommittee its review of ESBWR DCD, Chapter 17 (“Quality Assurance”):
  - Staff identified an open item whereby the applicant will identify the SSCs within the scope of the RAP (RAP SSCs)
- By ACRS letter dated November 20, 2007, ACRS planned to review the staff’s resolution of this open item
- In May 2008, the applicant submitted the list of RAP SSCs

Section 17.4 – Reliability Assurance Program During Design Phase

SSCs Within the Scope of RAP

- The RAP SSCs (within the design certification envelop) include:
  - All RTNSS SSCs identified under ESBWR DCD, Tier 2, Section 19A ("Regulatory Treatment of Non-Safety Systems"), which was reviewed as part of ESBWR DCD Chapter 19
  - Additional SSCs identified under Licensing Topical Report NEDO-33411, Revision 2 ("Risk Significance of Structures, Systems and Components for the Design Phase of the ESBWR")
- ESBWR DCD, Section 17.4 specifies COL Information Item 17.4-1-A:
  - The COL Applicant will identify the SSCs within the scope of the plant-specific RAP to include relevant COL site- and plant-specific information (e.g., the RAP SSCs identified in the DCD, updated using COL site- and plant-specific information)

Section 17.4 – Reliability Assurance Program During Design Phase

<u>**Staff's Review of NEDO-33411 – Methodology for Identifying Additional RAP SSCs**</u>

- Staff issued about 10 RAIs on the methodology for identifying additional RAP SSCs. These RAIs addressed such areas as:
  - Basis for risk importance thresholds that were used for identifying additional RAP SSCs
  - Use of PRA undeveloped basic events for identifying additional RAP SSCs
  - Use of seismic margins analysis (SMA) in identifying additional RAP SSCs

Section 17.4 – Reliability Assurance Program During Design Phase

<u>Staff's Review of NEDO-33411 – Methodology (continued)</u>

- The methodology for identifying additional RAP SSCs includes the use of probabilistic and deterministic analyses:
  - Use of at-power and shutdown PRAs for internal and external events resulting in core damage and large radiological releases
  - Consideration of risk insights and assumptions from the PRA and severe accident evaluations
  - Insights from the SMA
  - Consideration of operating experience from currently operating reactors
  - Use of an expert panel to review information associated with risk significance determinations
- Staff concludes that the methodology used to identify the RAP SSCs is adequate and meets the guidance in Item E of SECY-95-132 and SRP Section 17.4

Section 17.4 – Reliability Assurance Program During Design Phase

Staff's Review of NEDO-33411 – List of Additional RAP SSCs

- Staff issued about 25 RAIs on the list of additional RAP SSCs. These RAIs addressed such areas as:
  - Inclusion of additional SSCs based on the results, insights, and assumptions from the risk evaluations (e.g., specific SSCs associated with the SLCS, ICS, AC power, GDCS, remote shutdown panel)
  - Bases for not considering some SSCs in the scope of RAP (e.g., SSCs associated with the BOPCWS, CFWS, SLCS electrical heaters)
- The additional RAP SSCs (within the design certification envelop) are identified in Table 6 of NEDO-33411
- Staff concludes that the list of RAP SSCs is adequate and meets the guidance in Item E of SECY-95-132 and SRP Section 17.4

Section 17.4 – Reliability Assurance Program During Design Phase

Summary

- Staff concludes that the methodology used to identify the RAP SSCs is adequate and meets the guidance in Item E of SECY-95-132 and SRP Section 17.4
- Staff concludes that the list of RAP SSCs is adequate and meets the guidance in Item E of SECY-95-132 and SRP Section 17.4
- All RAIs associated with NEDO-33411 and SRP Section 17.4 are resolved

Section 17.4 – Reliability Assurance Program During Design Phase

Discussion/Committee Questions

Backup Slides
Reliability Assurance Program (RAP)

- Purpose of RAP is to ensure:
  - The reactor is designed, constructed, and operated consistent with the risk insights and key assumptions
  - The RAP SSCs do not degrade to an unacceptable level of reliability, availability, or condition during plant operations
  - The frequency of transients that challenge these SSCs is minimized
  - These SSCs will function reliably when challenged

- RAP is implemented in two stages:
  - Design-reliability assurance program (D-RAP) prior to fuel load
  - Use of operational programs to meet the objectives of RAP during operations phase

Backup Slides
Design Reliability Assurance Program

- D-RAP implementation includes:
  - Establishing and applying the essential elements of D-RAP.

    These are controls/processes that ensure the risk insights and key assumptions are consistent with the designed and constructed plant, and that the list of RAP SSCs is appropriately developed, maintained, and communicated to the appropriate organizations
  - Subjecting the non-safety-related RAP SSCs to QA controls (Part V, "Nonsafety Related SSC Quality Controls," of SRP Section 17.5)

Backup Slides
Design Reliability Assurance Program

- DC Applicant's Responsibilities:
  - Describe the details of the D-RAP (e.g., scope, purpose, objectives, framework, and phases of D-RAP)
  - Establish and apply the essential elements of D-RAP during DC design activities
  - Determine the RAP SSCs (within the scope of the DC) using a combination of probabilistic, deterministic, and other methods of analysis
  - For the non-safety-related RAP SSCs, implement QA controls during DC design activities
  - Propose an D-RAP ITAAC

- COL Applicant's Responsibilities:
  - Establish and apply the essential elements of D-RAP during COL design activities
  - Determine the RAP SSCs in the COL's D-RAP by introducing plant-specific information
  - For the non-safety-related RAP SSCs, implement QA controls during COL design activities
  - Propose a process for integrating RAP into operational programs

- COL Holder's Responsibilities:
  - Apply the essential elements of D-RAP during COL design and construction activities (which includes updating the list of RAP SSCs as changes are made to the plant-specific design and PRA)
  - For the non-safety-related RAP SSCs, implement QA controls during design and construction activities
  - Complete the D-RAP ITAAC
  - Integrates RAP into operational programs (e.g., maintenance rule, quality assurance, surveillance testing, inservice inspection, inservice testing, and maintenance programs)

ITAAC

Table 3.6-1 ITAAC For The Design Reliability Assurance Program		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
1. Ensure that the design of systems, structures, and components within the scope of the reliability assurance program (RAP SSCs) is consistent with the risk insights and key assumptions (e.g., SSC design, reliability, and availability).	An analysis will confirm that the design of all RAP SSCs has been completed in accordance with applicable D-RAP activities.	All RAP SSCs have been designed in accordance with the applicable reliability assurance activities for the D-RAP.

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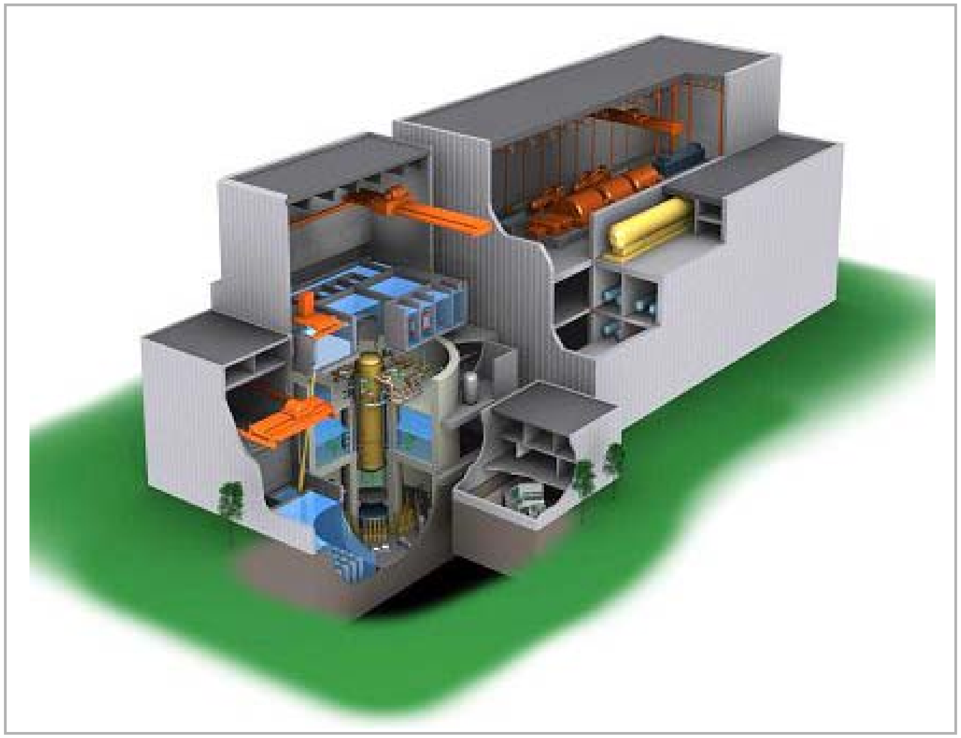
GE Hitachi Nuclear Energy

ESBWR Chapter 19A: Regulatory Treatment of Non-Safety Systems



Advisory Committee on Reactor Safeguards

Rick Wachowiak

Gary Miller

June 22, 2010

GE HITACHI

Introduction

Prior to DCD rev 4, issues focused on categorization

Presented configuration changes needed to resolve categorization in June 2008

Nine open items in the SER – Focus is on Treatment

- 22.5-6 Seismic category of some RTNSS support systems
- 22.5-7 Use of IBC-2003 criteria for some RTNSS equipment
- 22.5-21 Treatment for systems designated as "Support" in DCD 19A
- 22.5-9 External hazard protection for RTNSS equipment
- 22.5-5 Flood protection for RTNSS equipment
- 22.5-16 Treatment provisions for some RTNSS equipment
- 22.5-22 Instrumentation and bases for ACM entries not clear
- 22.5-23 Number of FAPCS trains required to be available
- 22.5-24 Number of SDG trains required to be available

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Open Issues 22.5-6 and 22.5-7

Summary of open items:

- Post-accident monitoring equipment designed using IBC-2003 seismic criteria
- Not clear how these criteria provide adequate protection

Response:

- Reclassified post-accident monitoring equipment to be the same as long-term cooling
- Designed as seismic Category I & II

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Changes for Long Term Safety and Seismic

Four functions with two sets of requirements for treatment

- B1 - Core cooling
- B1 - Containment Integrity
- B1 - Control room habitability with respect to dose
- B2 - Post-accident monitoring

Combined so that there is only one set of treatment requirements

- $B = B1 \sqcup B2$

Requirements for B1 now apply to all

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RTNSS B Design Treatment

Redundant Functions

Fire and flood protected

Hurricane category 5 missile protection

Designed for accident environment

Seismic Category II

Quality suppliers (not Appendix B)

Availability Controls Manual

Structures Housing RTNSS B Functions

System	RTNSS Criterion	Location	Building Category
FPS Diesel Driven Pump	B	Fire Pump Enclosure	Seismic Cat. I
FPS Motor Driven Pump	B	Fire Pump Enclosure	Seismic Cat. I
FPS to FAPCS Connection	B	Reactor Building	Seismic Cat. I
PARs	B	Containment	Seismic Cat. I
PCCS Vent Fans	B	Containment	Seismic Cat. I
CRHAVS Air Handling Units	B	Control Building	Seismic Cat. I
Emergency Lighting	B	Control Building	Seismic Cat. I
FPS Water Tank	B	Fire Pump Enclosure	Seismic Cat. I
FPS Diesel Fuel Oil Tank	B	Fire Pump Enclosure	Seismic Cat. I
Ancillary Diesel Generators	B	Ancillary DG Building	Seismic Cat. II
Ancillary AC Power Buses	B	Ancillary DG Building	Seismic Cat. II
Ancillary DG Fuel Oil Tank	B	Ancillary DG Building	Seismic Cat. II
Ancillary DG Fuel Oil Transfer Pump	B	Ancillary DG Building	Seismic Cat. II
Ancillary Diesel Building HVAC	B	Ancillary DG Building	Seismic Cat. II
CRHAVS Air Handling Unit auxiliary heaters and coolers	B	Control Building	Seismic Cat. I

DCD Table 19A-3

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Open Issue 22.5-21

Summary of open item:

- DCD was not clear concerning treatment of support systems
- Three designations
  - HRO – High Regulatory Oversight
  - LRO – Low Regulatory Oversight
  - Support
- Only HRO and LRO treatment was defined in the DCD

Response:

- Clarified that all "Support" systems received LRO treatment
- Explicitly added treatment for availability controls and external hazard protection for each system

RTNSS C Design Treatment

Redundant active components

Fire and flood protected

Hurricane category 5 missile protection

Designed for accident environment

Quality suppliers (not Appendix B)

Technical Specifications for SSCs Needed to Meet CDF and LRF Goals

Availability Controls Manual for Frontline Systems

RTNSS Functions and Availability Treatment

RTNSS Function	Description	Availability Controls
DPS – ARI Actuation	A - ATWS Rule	ACLCO 3.3.1
FPS Diesel Driven Pump	B - Long Term Core Cooling: RPV At-Power and Spent Fuel Pool; Long Term Containment Integrity	ACLCO 3.7.1
DPS – GDCS Injection	C - Focused PRA (CDF, LRF)High Regulatory Oversight	TS LCO 3.3.8.1
DPS – Scram	C - Focused PRA (CDF, LRF)	ACLCO 3.3.4
FAPCS (LPCI, SPC Modes)	C - Focused PRA (Uncertainty)	ACLCO 3.7.2 ACLCO 3.7.3
BiMAC Device	D - Containment Performance	AC 4.1
Reactor Building HVAC Accident Exhaust Filters	E – Adverse System Interactions	ACLCO 3.7.5
FPS Water Tank	B - Supports core cooling for refill of pools	ACLCO 3.7.1
Ancillary AC Power Buses	B - AC power distribution from Ancillary Diesel Generators to plant loads.	Maintenance Rule
Standby Diesel Generators	C - Supports FAPCS operation	ACLCO 3.8.1 ACLCO 3.8.2
6.9 kV PIP Buses	C - AC power distribution from Standby Diesel Generators to plant loads associated with FAPCS	Maintenance Rule

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Excerpts from DCD Table 19A-2

Open Issues 22.5-5 and 22.5-9

Summary of open items:

- Missile protection for non-seismic structures housing RTNSS equipment not provided
- Flood protection for RTNSS equipment not provided

Response:

- Added table 19A-4 to describe external hazard protection applicable to buildings housing RTNSS equipment
- Added ITAAC to confirm hazard protection for RTNSS equipment

Capability of RTNSS Related Structures

System Location	Internal Flooding	External Flooding	Internal Missiles	Extreme Wind and Missiles
Reactor Building Control Building Fuel Building Fire Pump Enclosure Ancillary DG building	The design/ installation of RTNSS equipment includes protection from the effects of internal flooding.	Seismic Category I structures are designed to withstand the flood level and groundwater level specified in Table 2.0-1 and described in Subsection 3.4.1.2. All exterior access openings are above flood level and exterior penetrations below design flood and groundwater levels are appropriately sealed as described in Subsection 3.4.1.1. On-site storage tanks are designed and constructed to minimize the risk of catastrophic failure and are located to allow drainage without damage to site facilities in the event of a tank rupture per Subsection 3.4.1.2. The Ancillary DG Building is designed to withstand external flooding with the same acceptance criteria as a Seismic Category I Structure.	There are no credible sources of internal missiles per Section 3.5.	Seismic Category I structures designed for tornado and extreme wind phenomena are described in Section 3.3 and Subsection 3.5.1.4. The Ancillary DG Building is designed for tornado and Category 5 hurricane wind loads . RTNSS systems in the Ancillary Diesel Building are protected from Category 5 hurricane wind and missiles .
Electric Building Service Water Building Turbine Building	The design/ installation of RTNSS equipment includes protection from the effects of internal flooding.	All exterior access openings are above flood level and exterior penetrations below design flood and groundwater levels are appropriately sealed; basemat and walls are designed for hydrostatic loading, therefore protected from external flooding.	N/A	The EB and SF are RTNSS Structures designed for Category 5 hurricane winds. RTNSS systems in the EB and SF are protected from Category 5 hurricane wind and missiles. The TB structure is designed for tornado and Category 5 hurricane wind loads . The design/installation of the RTNSS systems in the TB includes protection to comply with the requirement of Subsection 19A.8.3 to withstand winds and missiles generated from Category 5 hurricanes.
PSW System located outdoors	N/A	The design/installation of the RTNSS system includes protection from the effects of flooding.	N/A	The design/installation of the RTNSS system complies with the requirement of Subsection 19A.8.3 to withstand winds and missiles generated from Category 5 hurricanes.

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DCD Table 19A-4

Open Issue 22.5-16

Summary of open item:

- Details of the oversight for some RTNSS equipment were not apparent

Response:

- Provided revision to Table 19A-3 to specifically identify availability controls and monitoring

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Open Issue 22.5-22

Summary of open item:

- Availability controls (AC) did not state the associated instrumentation functions and the number of required divisions in the ACLCOs for some functions
- AC bases do not explicitly state the minimum level of system degradation that corresponds to a function being unavailable, or the number of divisions used to determine the test interval for each required division (or component) for AC Surveillance Requirements (ACSR)

Response:

- Any associated component failure causes entry into action "A" and an availability determination must be made at that time
- Clarified the number of divisions required for each ACLCO

Open Issue 22.5-23

Summary of open item:

- No AC Surveillance Requirements (ACSR) for FAPCS
- PRA assumes two FAPCS loops available, but ACLCO only requires one for modes 1, 2, 3 & 4

Response:

- FAPCS is a normally operating system, so no ACSR is required
- Revised ACLCO to require two loops to be available
  - 14 day ACLCO completion time for one loop unavailable

Open Issue 22.5-24

Summary of open item:

- PRA assumes two standby diesel generators available, but ACLCO only requires one for modes 1, 2, 3 & 4
- Not consistent with FAPCS availability requirements

Response:

- The level of redundancy in the ACLCO is consistent with the risk significance of the standby diesel generators
- ACLCO 3.0.3 requires the licensee to “Assess and Manage the risk of the resulting unit configuration”

HITACHI

Summary

GEH has addressed all open items related to the regulatory treatment of non-safety systems.

HITACHI

Presentation to the ACRS Subcommittee

ESBWR Design Certification Review
Chapter 19A (SER Chapter 22)

Presented by
NRO/DNRL & NRO/DSRA & NRO/DCIP

June 22, 2010

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Purpose:

- Brief the Subcommittee on the resolution of open items leading to the FSER for the ESBWR DCD application, Chapter 19A - Regulatory Treatment of Non-Safety Systems (RTNSS)

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Outline of Presentation:

- Background
- RAI Status Summary
- Resolution of Significant Open Items

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19

Background

- Prior Subcommittee briefings June and August 2008 on SER with open items
- Full Committee briefed on October 3, 2008
- Interim ACRS letter on Chapters 19 & 22, October 29, 2008 – no specific comments on Chapter 22
  - Committee will review resolution of open items at a future meeting
- Staff response to ACRS letter in November 2008

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

RAI Status Summary:

- All RAIs have been addressed by GEH and responses have been reviewed by staff
- All previous open items have been closed
- FSER drafted for ACRS review

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Key Issues Resolved Since Last Meeting

- Maintaining long-term safety (RTNSS criterion B)
  - Seismic design of RTNSS B SSCs
  - Flood related design
  - High winds related design
- Controlling the availability of RTNSS scope SSCs
  - Technical Specifications
  - Availability Controls Manual (ACM)
  - Assessing and managing risk via the Maintenance program

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issues 22.5-6 and 22.5-7

- Summary of open items:
  - Post-accident monitoring equipment designed using IBC-2003 seismic criteria
  - Not clear how these criteria provide adequate protection
- GEH Response:
  - Re-classified post-accident monitoring equipment to be the same as long-term cooling
  - Designed as seismic Category I & II
- Staff Findings:
  - Seismic design for long-term safety SSCs now consistent with Commission 's objective for seismic protection of RTNSS SSCs
  - Response acceptable

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issue 22.5-21

- Summary of open items:
  - DCD was not clear concerning treatment category designated "support"
  - Only HRO and LRO treatment was defined in the DCD
- GEH Response:
  - Clarified that all "Support" systems received LRO treatment
- Staff Findings:
  - treatment of "support" SSCs well defined and acceptable
  - Availability of "support" SSCs covered adequately in ACM
  - Response acceptable

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issues 22.5-5 and 22.5-9

- Summary of open items:
  - Missile protection for non-seismic structures housing RTNSS equipment not provided
  - Flood protection for RTNSS equipment not provided
- Response:
  - Added table 19A-4 to describe external hazard protection applicable to buildings housing RTNSS equipment
  - Added ITAAC to confirm hazard protection for RTNSS equipment
- Staff Findings:
  - Design of RTNSS SSCs for protection against the effects for flooding and high winds and associated design criteria adequately described in DCD
  - Design criteria acceptable to staff

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issue 22.5-16

- Summary of open item:
  - Details of the oversight for some RTNSS equipment were not apparent
- Response:
  - Provided revision to Table 19A-3 to specifically identify availability controls and monitoring
- Staff Findings:
  - Treatment of RTNSS SSCs clarified adequately in DCD
  - Response acceptable

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issue 22.5-22

- Summary of open item:
  - Availability controls (AC) did not state the associated instrumentation functions and the number of required divisions in the ACLCOs for some functions
- Response:
  - Clarified the number of divisions required for each ACLCO
- Staff Findings:
  - ACs have been updated where necessary to specify what parts of an SSC and support functions need to be available to satisfy ACLCO
  - Relationship between support system availability and ACLCO now explicitly stated in ACM
  - Response acceptable

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issue 22.5-22

- Summary of open item:
  - AC bases do not explicitly state the minimum level of system degradation that corresponds to a function being unavailable, or the number of divisions used to determine the test interval for each required division (or component) for AC Surveillance Requirements (ACSR)
- Response:
  - Any associated component failure causes entry into action "A" and an availability determination must be made at that time
- Staff Findings:
  - Conditions for entering Action statement well defined in ACM
  - Response acceptable

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issue 22.5-23

- Summary of open item:
  - No AC Surveillance Requirements (ACSR) for FAPCS
  - PRA assumes two FAPCS loops available, but ACLCO only requires one for modes 1, 2, 3 & 4
- Response:
  - FAPCS is a normally operating system, so no ACSR is required
  - Revised ACLCO to require two loops to be available — 14 day ACLCO completion time for one loop unavailable
- Staff Findings:
  - Staff agrees ACSR not needed for SSCs that are normally operating
  - Bases for FAPCS AC clarified in ACM
  - Repair times in ACM are reasonable and bounded by assumptions in PRA

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

Open Issue 22.5-24

- Summary of open item:
  - PRA assumes two standby diesel generators available, but ACLCO only requires one for modes 1, 2, 3 & 4
  - Not consistent with FAPCS availability requirements
- Response:
  - The level of redundancy in the ACLCO is consistent with the risk significance of the standby diesel generators
  - ACLCO 3.0.3 requires the licensee to "Assess and Manage the risk of the resulting unit configuration"
- Staff Findings:
  - Response acceptable: ACLCO 3.0.3 in conjunction with the Maintenance Rule section (a)(4) assures the risk of only having one SDG will be assessed using best available PRA model and data

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Chapter 19A (FSER Chap. 22)

- Discussion/Committee Questions