Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Subcommittee on the Westinghouse AP1000
DCD and AP1000 RCOL: Open Session

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Tuesday, September 21, 2010

Work Order No.: NRC-433 Pages 1-86

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

DISCLAIMER

UNITED STATES NUCLEAR REGULATORY COMMISSION'S
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, as reported herein, is a record of the discussions recorded at the meeting.

This transcript has not been reviewed, corrected, and edited, and it may contain inaccuracies.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

\+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

\+ + + + +

SUBCOMMITTEE ON THE WESTINGHOUSE AP1000 DCD

AND AP1000 RCOL

TUESDAY

SEPTEMBER 21, 2010

\+ + + + +

ROCKVILLE, MARYLAND

\+ + + + +

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

SUBCOMMITTEE MEMBERS:

HAROLD B. RAY, Chairman

SAID ABDEL-KHALIK, Member

J. SAM ARMIJO, Member

SANJOY BANERJEE, Member

MARIO V. BONACA, Member

CHARLES H. BROWN, Member

CONSULTANTS:

THOMAS KRESS

GRAHAM B. WALLIS

I-N-D-E-X

OPEN SESSION

CHAIRMAN RAY: In any event we will end the closed meeting for the purpose of taking up item 8 and we will keep you in place Paul, if you don't mind. And if you are prepared to do so, I ask you to continue by reviewing the COL.

MR. PIERINGER: Okay. This will be the Vogtle Chapter 18 -- Chapter 18 of the standard content SER with open items was issued with no open items. All sections are IBR except the ones I have listed below and I will go through each of those and explain how those -- what five areas are addressed.

In the HFE program management, the first COL information item dealt with HFE design of the EUF and tech support center. The first three bullets there repeat what we just talked about earlier for the Westinghouse. What I would like to go through is a little bit of our logic that we used in applying the COL application specific position to this information item.

It is documented in the Bellefonte SER, but to my memory that SER wasn't presented here. Vogtle referenced -- we took the Bellefonte information and that is referenced in the SER and so I am going to describe all that material without any more discussion of where it is documented and who is who.

When we got the initial response, it said we are going to design the EOF tech support center in accordance with NUREG-0737, which is clarification of TMI action plan requirements.

That particular NUREG doesn't have a significant amount of information in it about human factors. It basically says you will have a human factor control room but not much more. We were uncomfortable with that minimum level of detail.

Based on --

CHAIRMAN RAY: Good for you Paul.

MR. PIERINGER: Based upon our --

CHAIRMAN RAY: Lacking a lot of detail in other areas. I am glad you are taking that position. Go ahead.

MR. PIERINGER: Based upon an RAI and an RAI response, the applicant is committed to NUREG-0654, which talks about emergency planning. Within NUREG-0654 it has the phrase, "the tech support center and EOF will be established in accordance with 0696."

0696 actually has a lot of details in how you operate and design EOF tech support center facilities and a couple of other facilities as well.

So what I did is I took NUREG-0696 and on page 18.4 of that SER you will see how I have extracted the particular elements and I have compared that with 0711. Now we are not expecting the tech support center to have all of the HFE credentials of a control room but what I was looking for was that the main features of HFE were being addressed.

And so what I determined from 0696 was that it did address HFE with a reasonable degree of specificity and that when combined with the DCD design it provided an acceptable HFE footprint for the EOF and the tech support center.

One of the key ingredients that we just finished talking about was verification and validation: how do you validate the EOF if the EOF and tech support center design -- what I elected to give credit to was the fact that EOF's tech support centers are exercised on a regular basis because of drill requirements, so they have an annual drill, and then in addition to that there is also two ITAACs that have to be done prior to fuel load that specifically require full scope drills. And --

CHAIRMAN RAY: Paul, on a multi-unit site like this one, how does that work? Just once a year for the EOF or once a year per unit or what? I am anticipating something you are going to say?

MR. PIERINGER: No, you are forcing me back to my emergency planning days and I am trying to remember exactly how we did it, but I think James can help me a little bit.

MR. FLOWERS: I am James Flowers from Vogtle Southern Nuclear. I am the engineering guy on scene and human factor supervisor. For the EOF, we actually have graded exercises for Farley, Hatch and Vogtle at least once a year because it is a combined EOL and then for the tech support center it is at least once a year.

CHAIRMAN RAY: But when you have four units, it's once a year but how do you choose which unit you are going to have the exercise related to? Or does it matter?

MR. FLOWERS: I am going to let Ted answer that one. He is the EP person.

MR. AMUNDSON: I am Ted Amundson, Southern Nuclear Emergency Planning. When we get Vogtle's -- when we have the Vogtle site 1, 2, 3 and 4 up and running, we will be rotating the units that we are performing the exercise on and the off-year associated full scale drill -- we will be rotating that on a regular basis that we will work out with the NRC staff to make sure that we are covering everything appropriately.

So you will probably do it on Vogtle 1 one year, Vogtle 3 another year and so on and so forth.

CHAIRMAN RAY: Okay, so it is annual for the tech support center and then you will make sure it covers the different unit, or different NSSS designs by the

way you indicated, one year it will be AP1000, and the next year --

MR. AMUNDSON: That is correct.

CHAIRMAN RAY: Yes. Okay. I was just curious about that.

MR. PIERINGER: So what I was crediting here was the fact that this is being exercised every year, which gave you a continuing opportunity to improve the HFE design.

And so we determined that the COL applicant's response to the COL information item was appropriate and basically have accepted that response.

CHAIRMAN RAY: Right now there is a TSC at Vogtle, right?

MR. PIERINGER: Yes.

CHAIRMAN RAY: And this will be one that serves all four units?

MR. PIERINGER: I believe they are constructing a new tech support center.

MR. FLOWERS: This is James Flowers again. We are building a combined TSC for all four units. We currently have a combined TSC for units 1 and 2, and our new TSC is based on the existing emergency operation facilities designed in Birmingham, which handles multiple units, and so it is basically the same type of design and architecture that has been proven out and graded exercises for some time.

CHAIRMAN RAY: Well I guess I am just wondering, Paul is telling us about the HFE program as it pertains, as I understand it anyway, to the COL in this case, which is the AP1000, but I find myself wondering well, how is this -- does what he is saying apply to the TSC with respect to the existing units as well, or are they going to be completely separate, in other words they are just simply moved, the interface is moved to the new center without any other changes taking place? How is that going to be done?

MR. FLOWERS: Currently what the plan is, at least for Vogtle 3 and 4 and this will be the same thing for unit 1 and 2, before you can load fuel at Vogtle 3 and 4 we have to prove with an emergency drill and exercise, we have to prove in a graded exercise that the TSC is acceptable and I believe it is at least one year prior to fuel load, Ted, is that still correct?

For Vogtle 1 and 2 we would have to prove that in a graded exercise before we would move the existing TSC over and we would still follow NUREG-0696.

CHAIRMAN RAY: So there would be - I don't know whether you can say anything about this or not because you may not know -- but is it as if you were going to have an -- I don't want to use the word upgraded but I will because I cannot think of anything else to say right now -- an upgraded TSC with regard to 1 and 2?

In other words with the interface devices that you use to interface with the plant be changed or simply relocated, or do you know?

MR. PIERINGER: Well, the same type of architecture will be the same -- I mean the networks and hardware will be new but it's -- we are connecting to the existing business lines and stuff like that. We are not creating a separate set of hardware just for Vogtle 3 and 4. We have thought through that. We have decided that wasn't prudent to have duel sets of hardware so we are basically integrating everything that is going to have to go into the TSC onto the one network so that is seamless for 1, 2, 3 and 4 and again the only difference is where the data comes from. They will all use the same hardware and interfaces in the TSC and EOL.

CHAIRMAN RAY: Okay, thank you. Well, so shifting back to you Paul, does what he said make any difference in what you are talking about?

MR. PIERINGER: Well, Vogtle 1 and 2 have an accepted human factors design already associated with them, so if they move that, lock, stock and barrel into a new facility, they will have to do things like make sure the layouts are similar enough that they don't lose --

CHAIRMAN RAY: Well, what he just said was there is going to be a single set of interfaces, it's just where the data comes from that will be different, if I can paraphrase what he said.

MR. PIERINGER: Yes, that makes sense to me because you are only managing one event at a time and --

CHAIRMAN RAY: Well, maybe.

MR. PIERINGER: Hopefully.

CHAIRMAN RAY: Well, you can have an emergency that affects the site, can't you, and that affects all the units? Right? So you have to be prepared to manage an emergency at all units at the same time.

MR. PIERINGER: Yes, one emergency.

MR. AMUNDSON: If I may, again Ted Amundson from Southern Nuclear, I think in terms of the discussion here, what we are really talking about is how do we manage the human factors considerations when we transfer the various TSCs to the new TSC, how do we design the new TSC?

Certainly for Vogtle 3 and 4, we are committed for the displays to follow the Westinghouse human engineering program. But as we have conveyed to the staff throughout this process, human factors and human factors engineering is integral to the objectives and criteria that we evaluate and measure during all drills, all exercises.

We are continually evaluating human factors, elements and factors of our displays, of our human man machine interfaces and so on. When we encounter problems, we enter those into our corrective action program, we take corrective action, we monitor the effectiveness of that corrective action in the next drill or exercise.

So when we move Vogtle 1 and 2 over to the combined technical support center, we will establish performance criteria, objectives and so on, and we will measure those as they relate to human factors and take corrective action if there is any kind of a problem.

So there's human factors involved in this process all along. We always do that.

CHAIRMAN RAY: Well, that wasn't my question, really, but I am not sure I can ask it precisely enough. I am really trying to figure out what impact on what he is looking at in the context of Vogtle 3 and 4 there is of the fact that it will include Vogtle 1 and 2.

I mean, you described a process which I think we all understand and would expect, but that does not answer the question, well what is the impact on what he is looking at, of the fact that you are going to have two other units being managed through the same set of interfaces?

If I understand you correctly, it is not just taking what is in one place and moving it to another place; you are actually going to have a set of devices communication tools and so on, which -- information sets -- which apply equally to all four units.

MR. FLOWERS: This is James Flowers again from Southern Nuclear. Let me just put it this way. This is not a new -- what you are proposing is not a new issue for us.

CHAIRMAN RAY: Certainly I would hope not.

MR. FLOWERS: It is one we have been addressing because again, we do have a combined emergency operation facility for Vogtle 1 and 2, for Farley and Hatch, and we have been graded on multiple units having exercises through that facility. And we have been graded on multiple units at each site having a particular drill or graded exercise and from the TSCs --

CHAIRMAN RAY: I don't want to cut you off --

MR. FLOWERS: and for Vogtle 1 and 2 we do it with multiple issues on site.

CHAIRMAN RAY: Okay, look, I have been through many graded exercises myself. I have been in TSCs, through drills that I am just saying to you that it is not the same thing to have four units have to be managed from a TSC as it is one or two units, the two units being identical.

And I am just asking a simple question, which is, how is the stuff that people use in a TSC, which is not the same as in an EOF, going to be integrated so that it doesn't affect what he is saying about what he looked at, which was just the commitments that pertain to Vogtle 3 and 4, how is that going to be affected by the fact that you are dealing with 1 and 2 as well?

And not in an adjacent room, but in the same room, with the same equipment? That is the question I am asking. And I don't want a processed answer that we are going to do it right and we will have corrective action programs when things are not the way they should be. That is taken for granted. I just want to know how you have considered the effect of having to manage four units and I am particularly trying to ask him, because he is talking about looking at what commitments pertain to Vogtle 3 and 4, and I am asking the question, well, how is that affected by the fact that you are going to integrate 1 and 2 in the same system set?

And that is the question and I guess I don't really appreciate there's an answer yet except that we have thought about it and we are going to work on it. Is that basically it?

It is not the same thing to say okay, we have got a set of things here which will adequately ensure the TSC works for 3 and 4, if you also say and by the way it is going to serve 1 and 2 as well. That is not a trivial addition, I guess I would say, and the fact that the EOF already deals with multiple units is interesting but doesn't really answer the question. I don't mean to --

MR. PIERINGER: I am thinking. I mean, I have -- I don't have a good answer.

CHAIRMAN RAY: That's fine.

MR. PIERINGER: I have thought it, that -- but I don't really have an eloquent way to communicate them to you.

CHAIRMAN RAY: Okay.

MR. PIERINGER: They are not complete enough to --

CHAIRMAN RAY: Let me break it down this way. Would you agree with me that the review that you are doing on 3 and 4, and that's all we are talking about in this COL, really, is -- it's relevant to that review that we are going to include in the stuff that you are applying these criteria to, to other units of a different design? That seems to me to be a relevant fact. I don't mean to raise things that are irrelevant --

MR. PIERINGER: I think it's relevant. I

just don't know how significant it is, because there will be a lot of common elements, you know and so the key is to recognize the things that are dissimilar and provide a reasonable method for being able to differentiate the difference --

CHAIRMAN RAY: That's right.

MR. PIERINGER: and ensure that the people in those centers don't get confused between those things that belong to 1 and 2 and those things that belong to 3 and 4.

CHAIRMAN RAY: Yes, and a tech support center is a technical support center. It is meant to support the plant, which means it has got to know a lot of things about the plant, right? And all that stuff has got to be accessible and so on and so forth.

There is now an existing TSC for units 1 and 2. And I am asking how have you considered the effect of now having two different units in the same platform, if I can use that term, for providing technical support during an emergency? I don't know how to say it any other way.

MR. PIERINGER: And I think we would say that we have not looked at the specific platform that would be used to present the information. There is maybe an assumption in my mind that they are either --

if you have a computer system, you can pull up the data from Vogtle 1 and unit 2 and that will display itself with the proper human performance design, or you can ask the computer to give you all the data from units 3 and 4 and that will be displayed in the --

CHAIRMAN RAY: I understand that. That is absolutely true as you say. But a little bit ago, you were talking about how you were insistent upon, I think rightly so, that there be a lot of facts provided, enough detail provided, that you could reach a finding. I am asking you about this particular aspect. It seems to me like there ought to be some consideration given to, do we know how they are going to do what you just said?

MR. DESAULNIERS: Paul, this is David Desaulniers, also with the staff, senior technical adviser for human factors. Is it not possible that this issue would be addressed through the integrated system validation? It would seem as though that would be a means to address it, although I am not involved in this review so would not know if in this case they propose to address that in this case.

MR. PIERINGER: It won't be addressed through the integrated system validation that is done for the control room, not on the full scope simulator.

That is a different design. The applicants have to demonstrate that the EOF and tech support center are viable facilities as part of the emergency drill.

CHAIRMAN RAY: Well, all right.

MR. PIERINGER: That does not go specific as --

CHAIRMAN RAY: I don't think we should work the problem here. Let's do this.

MR. PIERINGER: There is one more comment.

MS. REED: Julie Reed from Westinghouse. In the design of all of our displays, the system-based displays, function-based displays, task-based displays and the displays we are specifically designing to support TSC and EOF activities, all of those displays will include the unit-specific number as part of the title or as part of the identification for indications, alarms and controls.

So for all of Vogtle 3 and 4, we will have the unit-specific number on every display you look at.

CHAIRMAN RAY: Okay, well I would hope that would be the case, but it doesn't go far enough. Look, what I think what we ought to do is create an open item here and deal with it later because we are not going to get very far here. It seems to me as if when somebody comes with a criteria for a TSC on two units like we are talking about here, and you learn that oh, by the way, it is also the same TSC, not the same building merely with different rooms, but the same room, the same equipment, the same as far as I can tell anyway, the same process by which the TSC does its job, is going to support all four units.

Then the logical question would be okay, how are we going to make sure that it is capable of doing that from a human factors standpoint?

Now, one way is well, let's make sure we label the information so we know which unit it is coming from. Well, all right, that's a good start, but that doesn't get you very far. I think we need to know more about it than we do so we are going to just stop here, make an open item and say we have got to talk about this after you guys have had a chance to think about it and tell us what you feel is the answer, okay?

And I don't think the answer is simply as well, they will have to prove it to us after it is all done, because you know, that is not what we are doing here is saying we want to make sure the plant operates when it is built and that is the end of it. We want to know how you are going to do this with enough confidence that we feel like, okay, go ahead, right?

And you yourself have said that many times here this morning.

Okay is there more that you would like to go into? We will set this aside, make an open item, come back to it.

MR. PIERINGER: That concludes 18.2.

CHAIRMAN RAY: Okay.

MR. PIERINGER: On the next slide, 18.6, the applicant endorsed the standard COL response. In summary what that means is that 18.6 addresses staffing and qualifications. That means that they will have -- they will meet minimum manning requirements in 50.54.

And 18.10, which is the training program development, the standard response says we will develop a SAT-based training program. That is done as part of the operating programs in Chapter 13.

And then 18.14 talks about human performance monitoring. The standard response is that continuing human performance monitoring is accomplished by the corrective action program and by the operator training programs and both of those are addressed under Chapter 13 with the training program being part of an operational program.

And 18.6, staffing and quals, the

applicant also provided additional information on site-specific plant operating experience. This is like we operate this many plants for this many years and that is why there is reasonable assurance that we have the operating experience necessary to operate with the staffing network we are explaining to you.

Staffing and quals is -- staffing itself is addressed in Chapter 13 and that is where they commit to the requirements and training levels for the different people. So these three sections are really pointers to Chapter 13.

The next slide talks about HSI design. There is one departure: the location of the tech support center and the operational support center are not what is specified in the DCD. That doesn't affect the human factors program because tech support center HFE design is independent of location and the operational support center isn't in the program's scope.

Location, however, I think I mentioned earlier, does have some specific guidelines that have to be addressed and those are discussed in Chapter 13.3 at the FSER.

MEMBER BROWN: Why wouldn't the OSC and the TSC be, I don't mean co-located in the same room but at least adjacent or something. Is that technical information -- maybe I don't understand the purpose of the operation support center, but operations I thought were like technical information also, so am I asking the wrong question?

CHAIRMAN RAY: People who respond into the plant with --

MEMBER BROWN: Pardon?

CHAIRMAN RAY: It's people who respond into the plant with equipment tools, instruments, that kind of stuff.

MEMBER BROWN: Oh, okay it's that type of --

MR. PIERINGER: Maintenance and procurement activities --

MEMBER BROWN: Okay. That's fine. Thank you.

CHAIRMAN RAY: Spare parts.

MR. PIERINGER: And that concludes my presentation, pending any further questions.

CHAIRMAN RAY: Okay, we will see about an item and it includes -- you know we are here all day -- or at least as long as needed today, so if you want to come back this afternoon and talk about this after you have had a chance to think about it, we may be able to close it out today but in any event we have an open item for this purpose. Any other questions? Okay, thank you.

All right. We are -- let's take a look at the agenda now. We would be forecasting at this point, Eileen, an early end of the day. We have got a substantial discussion on the -- what is labeled here water drainage corrosion issue and Chapter 5, and then we want to end the day by discussing upcoming interactions. Is that your --? Do you have anything to add to that?

MS. MCKENNA: No, I think that is correct. I think as we said yesterday, we envision that this next topic is going to take more than the half hour that was originally laid out and one of the reasons we were trying to make more time, because I think there is -- it turns out there is a lot of material that wasn't as prepared to go through and I know there was a lot of interest in the committee, so --

CHAIRMAN RAY: All right. Well good. It seems to me, then, we should go ahead and break early so that we don't interrupt that discussion and we will come back then at 10 minutes to 10.

(Whereupon the matter went off the record at 9:33 a.m. and back on the record at 9:53 a.m. in

Closed Session.)

CHAIRMAN RAY: The final session of the day with -- pardon me. Open line? Contrary to the agenda this will be an open session as you can hear, and we have got a member of the public who has been -- so this will be the first session in open session today and it will involve the staff's discussion with us of their final safety analysis report of Chapter 5 of the DCD.

Please proceed.

MR. BUCKBERG: Good afternoon. My name is Perry Buckberg. I am a senior project manager from the AP1000 licensing branch of the NRC. I am here to present Chapter 5 of the advanced final of SER.

Presenting the primary Chapter 5 issues from the staff's evaluation will be John Honcharik to my right, some of the other key staff who contributed to the evaluation of Chapter 5 are Neil Ray, Cheng Wu, Jean Xi and John Budzynski. You may have met them at other times.

Chapter 5 of the SER with open items was issued on June 17 of 2009. There was four open items that Westinghouse detailed in their presentation. The Chapter 5 was last presented to the subcommittee in July 2009.

One RAI was issued in June 2009 just after the chapter was issued. It evolved to three RAIs which you heard some details about from Westinghouse and we will provide some details as well.

So we had open items and we had RAIs we dealt with since last June. The advanced final SER we are presenting today was issued on August 25 this year. We are going to discuss in detail open item 5.4.1-CIB1-01. It has to do with the reactor coolant pump flywheel analysis.

And we are going to discuss two of the RAIs, 5.2.3.-CIB-01 having to do with reactor coolant pressure boundary materials and its little brother, 03, has to do with the same but more specifically Quickloc.

John will continue with the details on the open items and RAIs. It's all yours.

MR. HONCHARIK: Good afternoon. My name is John Honcharik and I am a senior materials engineer. As you have probably noted I will be talking about these three issues. The first is the reactor coolant pump and the flywheel analysis so I'll get started with that.

For the reactor coolant pump flywheel, this is this one open item and basically it stated that the materials used in a flywheel analysis should be included in the DCD so its analysis will bound the actual production flywheel as Westinghouse has stated in their presentation.

However during this time period, Westinghouse proposed several things. One was the change in that flywheel material and also some other changes that would impact that flywheel analysis.

And these are basically some dimensional changes in the flywheel and also changes to the pump parts that will contain the postulated flywheel rupture.

So now we go to the next slide. At first I am going go talk about the flywheel change, the material change. Previously, the flywheel was heavy tungsten insert with type 403 stainless steel inner hub and 18-nickel maraging alloy steel outer hub. Now all this was encased in the alloy 625 and the previous flywheel analysis was performed using the material properties of these materials. And we had previously found it acceptable. However, Westinghouse then proposed a new material for the outer hub and this material is the 18-manganese 18-chrome alloy steel.

Okay so this material was not included or bounded by the previous flywheel analysis so a new analysis should be performed in order to assure that a -- to demonstrate that the flywheel will not generate a missile in order to meet the requirements of GDC 4.

CHAIRMAN RAY: In the prior approval, can you tell me there was credit taken for the flywheel material not coming in contact with reactor coolant based on its being encased in a can or something?

MR. HONCHARIK: Well I was going to go into --

CHAIRMAN RAY: Well I have looked where you are going. If you are going to talk about that, fine I just don't see it in your slides here. And it seemed like a simple enough question, I could ask it now. I am trying to figure out if you are taking credit for the I'll call it the can -- the enclosure of the flywheel maintaining its integrity so that there is no leakage of reactor coolant contacting the flywheel material itself.

MR. HONCHARIK: Well, for the flywheel, they never credited the enclosure for the flywheel analysis.

CHAIRMAN RAY: In the original design?

MR. HONCHARIK: That's an original -- the original design as I was going to show was basically a tungsten alloy, okay, I mean depleted uranium.

CHAIRMAN RAY: Yes, you call it tungsten. That's what made me a little bit confused.

MR. HONCHARIK: Yes I'm sorry, but it was depleted uranium and that was Rev. 15, which was approved.

Now what I said previously was that was Rev. 16 when they changed it to the tungsten, and we had looked at their analysis for that and we found it acceptable as long as they would include the material in the DCD, okay?

But we sent that and they were going to change it but they came in and said we are going to include it in the DCD and oh by the way, we changed the material.

CHAIRMAN RAY: All right, well go ahead. At some point just try and be clear about whether you are taking credit for this pressure -- this protection.

MR. HONCHARIK: The enclosure is not credited and Westinghouse also in their flywheel analysis is basically a little different than some other -- the current ones basically would say, okay, I had this alloy steel, and I am going to assume crack growth through it, so and basically I would do an analysis in what is the time period for that crack to grow to critical size and basically that would be 10, 20 years.

Therefore I should do an inspection prior to that to make sure that I keep the integrity of the flywheel. For the AP1000, as you know, this flywheel is canned motor, it's not really accessible.

So what they did was they did a flywheel analysis to show that even if it did fail, it would not penetrate the reactor coolant pump pressure boundary.

CHAIRMAN RAY: On that point, I just want one clarification. Was that done with a stainless steel body to the pump or is that carbon steel? Because I know you -- they have recently changed to use carbon steel --

MR. HONCHARIK: No I was going to get into that but it's stainless steel, that has been and always will be stainless steel around where the flywheel is. There are some other areas of the pump where the stator is, where they changed that to carbon steel.

CHAIRMAN RAY: Okay. But don't -- so the analysis is still valid. It was stainless steel before?

MR. HONCHARIK: Right.

CHAIRMAN RAY: Still stainless steel.

MR. HONCHARIK: Right.

CHAIRMAN RAY: Okay.

MR. HONCHARIK: So basically I guess we are on -- so Westinghouse performed this new analysis which included the new material properties and like I stated, the analysis basically used a similar methodology and basically they made sure that there was sufficient strength to prevent a rupture and in addition that basically they postulated a flywheel rupture and it would be contained by the pump, and therefore not create a missile.

And basically that is what we are basically looking at for a safety aspect, not create a missile inside containment.

CHAIRMAN RAY: I did ask at a prior discussion of this whether it would have a potential to create an inner system leakage, that is from the reactor coolant system to the cooling water system, which doesn't entail creating a missile outside the pump but would expose the cooling water system to reactor coolant pressure and coolant so that you would create a loss of coolant accident through the cooling water path.

MR. HONCHARIK: Cooling water, you mean in the pump?

CHAIRMAN RAY: Yes. The motor has cooling water, would the flywheel potentially a leakage path from the reactor coolant system into the cooling water system and the answer that I got back at that time was no, for reasons that they explained to me at the time that wouldn't happen.

I just want to ask you, have you considered that and do you agree with that conclusion?

MR. HONCHARIK: Yes, basically the area that they consider for this, for the ruptured flywheel and what would contain it, they actually didn't take credit for the whole casing part. They only took a small part of it.

And that -- and the whole surrounding area of that pump, of the flywheel is more than that thickness all the way around it so yes, I would not see that causing a leak out through the motor.

CHAIRMAN RAY: Through the cooling water system.

MR. HONCHARIK: Right.

CHAIRMAN RAY: Yes. Okay.

MR. HONCHARIK: Basically in addition to the material changes, the flywheel as I mentioned was also changed. This was due to the fact that the 18 chrome 18 manganese has a lower strength than 18 nickel maraging alloy steel that they previously used. So this outer hub size was increased.

But basically also the reactor coolant pump pressure boundary, which would contain the postulated rupture flywheel was also changed and they added a new part called the stator closure ring.

I can turn to the next slide and then we can see a little bit. Under the caption where it says Rev. 15, that was basically a flywheel of the depleted uranium and that also had an enclosure around it. And there you can see the part is basically called a retaining ring that has got a cross hash next to it, and next to it -- then you have on top of it, is the casing, the pump, casing. They did not take credit for the pump casing.

And also it is only a small part of that retaining ring that they credited for containing that flywheel.

CHAIRMAN RAY: Shouldn't we be talking about two flywheels?

MR. HONCHARIK: Yes, that's the upper and then the lower is at the bottom.

CHAIRMAN RAY: Okay well earlier I was talking about the lower one so let's just --

MEMBER ARMIJO: Which is the bigger one and has more energy, is it the lower one?

MR. HONCHARIK: I think it's the upper one has more energy.

MEMBER ARMIJO: Okay.

CHAIRMAN RAY: I was talking about the lower one and I wasn't clear but anyway, let's keep -- you were just talking about the upper one I think when you were talking about the pump casing?

MR. HONCHARIK: Right, yes, what I am talking about now is the pump casing. But they did not take credit for the pump casing. It's just that one piece, there the retaining ring.

CHAIRMAN RAY: Right.

MR. HONCHARIK: But now in the current version, as you can see, around the upper flywheel, you see that there is a retaining -- see there is a little terminology that is called a retainer ring on the flywheel but also there is a retaining ring that is attached to the pump casing that holds in the flywheel and then there is also -- also they added the stator closure ring and the stator closure and actually that is called a thermal barrier I'm sorry, that goes around the flywheel.

So as you can see there is three parts

there now where previously there was one. Let's go to the next slide. And this just shows kind of what happened in Rev. 16 where they had the thermal barrier but they added that lower portion which was the stator ring. Where it is now, it has three pieces.

So as we go to the next slide, so after various rounds of RAIs, I looked at the flywheel analysis. I determined it was acceptable because it accounted for all the changes. First, the material properties for the 18 manganese 18 chrome alloy steel was used and also the flywheel dimensional changes were accounted for, therefore it increased the mass and so on.

Also, the analysis was conservative since it only used the small portion of the actual pump thickness okay? And that was only credited for containing hte ruptured flywheel. And also the bolting of the reactor coolant pressure boundary parts, those three items, would contain the postulated ruptured flywheel.

So basically these parts act as one and these parts act as one due to large compressive stresses from the main flange bolts and also the --

CHAIRMAN RAY: Are you talking about the upper portion -- upper flywheel now?

MR. HONCHARIK: Yes I am just talking about the upper flywheel.

CHAIRMAN RAY: Okay because that is really not clear and it's really hard to follow this. It's hard to follow this because at times you are talking just about the upper flywheel.

MR. HONCHARIK: Well basically, most of the problems were up with the upper flywheel so basically what I am talking about now is mainly for the upper flywheel, other than the generic materials and such. But this part where I said that the reactor coolant pressure boundary parts have changed, that's for the upper flywheel.

MR. BUCKBERG: This open item dealt only with the upper flywheel, didn't it?

CHAIRMAN RAY: Well it is a canned motor pump so I guess I'm thinking the entire thing is exposed to reactor coolant, upper and lower both, isn't it?

MR. HONCHARIK: Right.

CHAIRMAN RAY: Okay.

MR. HONCHARIK: I guess if you go back to -- if you see on the upper flywheel where the pump casing meets, there are basically two pieces attached there, surrounding the flywheel -- one here and this piece. That's what they credit for containing that flywheel. Now we have this piece, this small piece and this other piece with all these bolts and they also changed, if you go back one previous slide --

CHAIRMAN RAY: Well before you do --

MR. HONCHARIK: See, previously, in Rev. 15, it was just this one piece, one thermal barrier. Now if you go over here, now it's three pieces.

So that's one of the changes that I asked them about, including the material properties for the flywheel analysis but also if you -- what about the sheer mechanism of these bolts, is it strong enough that it will capture it and won't sheer the bolts?

CHAIRMAN RAY: Well, it's -- yes, or if the thing seizes, are the bolts going to keep the motor attached to the pump?

MR. HONCHARIK: Right so those were some questions.

CHAIRMAN RAY: Well can you talk about the bottom one just a little bit the same way, I mean it hasn't changed at all I guess, the bottom flywheel.

MR. HONCHARIK: Right, the bottom flywheel has not changed. The reactor coolant pressure boundary has not changed.

CHAIRMAN RAY: So there's nothing changed there at all.

MR. HONCHARIK: Except for the flywheel material, the 18 manganese 18 chrome outer hub.

MEMBER ARMIJO: But the mass of the upper flywheel compared to the lower flywheel is quite a bit larger so that really kind of becomes a limiting component for a missile analysis, right?

MR. HONCHARIK: Right, but we also -- we looked at both to make sure that neither one would generate missile. So t he analysis covered both upper and lower for generating a missile and being contained within the pump.

CHAIRMAN RAY: And you did look at the seized rotor case in terms of those bolts you are talking about?

MR. HONCHARIK: Yes.

CHAIRMAN RAY: Will they keep it attached?

MR. HONCHARIK: Yes. And basically we found that yes, it would. And so basically here is where there's a lot of changes that were made so that --

MEMBER BONACA: Those changes were made to improve specifically to improve the capability of the pump to retain missiles?

MR. HONCHARIK: No it was not due to that purpose, it was for other reasons.

MEMBER BONACA: For other reasons.

MR. HONCHARIK: For operability. It had nothing to do with that. We will go to the next -- and we found that the mechanism for sheer for the bolts and everything that were okay and those three parts that also had recess fits that would transfer the sheer load. So therefore the flywheel analysis basically accounted for all the changes that were made, basically the 18 manganese chrome outer hub of the flywheel and also the changes of the reactor coolant pressure boundary parts.

And therefore they demonstrated that they would not generate a missile.

MEMBER ARMIJO: When that pump comes to a grinding halt, if this ever happened, assuming it didn't leak, what happens in the core? How much do you drop that core flow? How fast and what does it do to the core?

MR. HONCHARIK: That was not part of my analysis, I am looking at the --

CHAIRMAN RAY: This is the mechanical --

MR. WISEMAN: This is Dale Wiseman from Westinghouse. There is a safety analysis, a locked rotor safety analysis that looks at the impact on the core.

MEMBER ARMIJO: And you have done that. It was satisfactory?

MR. WISEMAN: Yes, it has been done.

DR. WALLIS: So what protects the flywheel from the reactor coolant? I thought there was something about it being enclosed.

CHAIRMAN RAY: Well it was, but he said they didn't take credit for that preventing a missile.

MR. HONCHARIK: They assume that the outer hub that 18 manganese 18 chrome frame that holds those tunsten inserts would shatter and the tungsten inserts would impact the wall and they actually also have analyzed it where if it impacted the same location, all the inserts would go in that one location.

CHAIRMAN RAY: Whether or not cracks is irrelevant because if it does, it won't get out.

MR. HONCHARIK: Right. They have postulated it's going to fail.

DR. WALLIS: Okay. So it generates a missile but the missile doesn't get out?

MR. HONCHARIK: That is correct.

DR. WALLIS: That clears it up. Okay.

MR. HONCHARIK: So basically if it cracks it still will be contained. Okay next we can talk about the materials that are used. We found it acceptable because the proposed use for carbon steel which I will discuss a little later for the stator of main flange and the stator shell are not exposed to reactor coolant and therefore are acceptable.

Also the 18 manganese 18 chrome outer flywheel material we found acceptable based on the operating experience since the mid-`80s for the main steam turbine main generator retainer rings. Sl that was what it was first developed for. They had a lot of problems and initially they had 18 manganese 5 chrome and they had a lot of stress corrosion cracking problems but with the 18 manganese 18 chrome, as the Westinghouse stated, it acts more like a stainless steel, so it is very resistant to both stress corrosion cracking and hydrogen embrittlement, and also I just want to point out that like I said, all that other flywheel is encased in an alloy 625 enclosure which would prevent reactor coolant from contacting the flywheel materials.

CHAIRMAN RAY: Well it sounds to me like then you take credit for that.

MR. HONCHARIK: No they only take credit -- they are only saying that they encase it so that they will try to keep the environment out so it's just another factor that they added in.

That's not their primary goal. The primary goal is the pump will keep the -- contain the postulated ruptured flywheel.

MEMBER BROWN: So if you actually got primary coolant in there and you had stress corrosion cracking and it shattered under that then it would still hold it all so --

MR. HONCHARIK: It will stop but --

MEMBER BROWN: So the question of stress corrosion cracking becomes moot?

MR. HONCHARIK: Moot.

MEMBER ARMIJO: For that accident but you know I think it gets down to a more basic issue of whether the staff will allow a material, a high energy component to be used that has not been tested in the environment of interest and just takes, accepts that oh, it's pretty good in some other environments. Therefore it must be good in this environment. It's just an issue of are you going to test the materials or not in a relevant environment and that's my concern. I don't have any problem with the fact that the actual missile analysis has plenty of conservatism. I looked at that. That looked fine.

What really bothered me is the fact that this retainer ring, which is really a key component, hasn't been tested in an environment that could occur particularly for a pump that can't be inspected. And if you can't assure that the alloy 625 has kept the retainer ring from the environment, then you have an obligation, in my opinion, to test the retainer ring material at whatever yield stress you operate it at in primary PWR water chemistry, not a steam generator, not a hydrogen environment, but the actual environment of interest. That's really -- that's a central issue there, because it's a challenge to a major component that shouldn't exist.

I don't think a good materials guy should ever let this happen.

MR. HONCHARIK: Well I agree that yes, they should do testing for that. Now especially if it would not be contained, but I mean --

MEMBER ARMIJO: Even if it is contained, you know --

MR. HONCHARIK: Right but the only --

MEMBER ARMIJO: Just from investment protection if nothing else.

MR. HONCHARIK: Right. Exactly. That's an investment protection. The NRC does not look at it for investment protection, but looks for safety-related items and one of the items is generation of missiles in GDC 4. And the whole reason why they do their flywheel analysis is to make sure that they do not generate a missile and for this AP1000 case, they are the only ones that I know that have a pump that actually contains the postulated missile.

DR. WALLIS: Well it's okay for missiles but you might increase the probability of getting a locked rotor which would be of concern.

MEMBER ARMIJO: And the unknowns, the things that might happen that we haven't really analyzed or torquing that whole structure and sheering some bolts, causing some leaks, other stuff. It just -- it seems that something that important, we test everything else inside. I just don't understand why we wouldn't -- we just accept a contingent that it is good in one environment therefore it must be good in an environment that could exist in that.

MR. HONCHARIK: Right but I understand your point, but I guess what I am trying to say is that they are trying to do more than one thing to prevent a missile or fracture. The first and foremost is that it is contained within the pump, okay?

But in order to preclude them actually having a fractured rotor, I mean flywheel, they went to contain that material, okay, in the alloy 625 enclosure, right, to keep the reactor coolant off there.

But in addition they noticed that the 18 nickel, which is a nickel alloy which may be subjected to PWSCC so they went to this 18 manganese 18 chrome, which was more resistant to stress corrosion cracking based on some other operating experience that may not be exactly the same. But it's similar. It's a very aggressive environment and they have had many years of experience where it is very good.

MEMBER ARMIJO: Yes and that is where the fundamental problem is.

MR. HONCHARIK: In that case it is more than just okay, whether or not they test that just one material in that water, because they actually went to say that they are going to preclude the contact of that material from water by using a 625 enclosure and in addition they are going to contain the postulated flywheel.

CHAIRMAN RAY: Well you use the word preclude, I mean that seems to be going too far. I think we understand your rationale as far as it goes. That doesn't seem satisfying and I am trying to figure out what to do about it.

For my part, I am not so much concerned about the fact that it appears the missiles will be contained, if there were such. But I am just skeptical of our ability to correctly analyze the impact on the reactor coolant pressure boundary of a locked rotor event. Talk to me about how you decided that it wouldn't result in a lost coolant accident as a result of the rotor seizing.

How did you do that?

MR. HONCHARIK: I didn't specifically do an analysis to see whether or not there was a LOCA. In mean, the whole point of doing the analysis was --

CHAIRMAN RAY: What is this -- did you look at the stress levels in the bolting?

MR. HONCHARIK: Yes they provided information about stress levels in the bolting and also that not only the stress levels in the bolting, but how the actual pieces are put together. Those pieces have integral grooves in there and recess fits in order to make sure that any sheer mechanism would be captured throughout the whole piece.

CHAIRMAN RAY: So the load doesn't get transferred through the bolt, the torque doesn't get transferred through the bolts, it's through some mechanism that transfers the load to the plenum other than through the bolting?

MR. HONCHARIK: Right, the bolting and also the pieces through the recess fits on the pictures.

CHAIRMAN RAY: Yes show me.

MR. HONCHARIK: If you go to -- this picture doesn't show it but these pieces basically have recess fits --

CHAIRMAN RAY: Like keys you mean?

MR. HONCHARIK: Well, basically yes, just lips like a half-inch lip or so.

CHAIRMAN RAY: But it sounds like that doesn't resist torque, does it? How does it, the recessed lip, resist the torque? You are talking about a torque that would result in a threat to that pressure boundary at that point, where you are pointing now.

MR. HONCHARIK: Right but I mean also you have got to realize that there are numerous bolts going around --

CHAIRMAN RAY: I do.

MR. HONCHARIK: There are 24 bolts.

CHAIRMAN RAY: But understand, this is a flywheel.

MR. HONCHARIK: I understand that.

CHAIRMAN RAY: Okay. And so the load will depend entirely on how quickly it stops. It's a very, very difficult thing to model. I've never seen anybody analyze it. Maybe there is some design assumptions that you can use for this kind of an event. If so, I'd just like to hear about it.

I mean, the bolts are meant to hold the thing in place but if you get a locked rotor you have an enormous torque all of a sudden imposed on that joint. And I'm just saying how did you decide that it wouldn't result in a loss of coolant, a leak?

I mean this is a big heavy thing hanging on the bottom of the plenum, you've got an enormous momentum there that has to be taken out somehow or transferred to the steam generator if the rotor locks due to a failure of either of the flywheels, either one of them, and it seemed to me like well this is a very difficult problem to analyze and I am just asking how did you do it?

MR. HONCHARIK: Well basically I didn't do a detailed analysis for that. I basically used the stresses that they gave for the bolts along the design of the --

CHAIRMAN RAY: Those stresses assume now a locked rotor event, is that correct?

MR. HONCHARIK: No, wear e just talking

about the fractured flywheel.

DR. WALLIS: The flywheel, that's all your are talking about.

CHAIRMAN RAY: I'm talking about the effect on that joint of a fracture flywheel is likely to lock the rotor, wouldn't you say?

DR. WALLIS: It depends on how quickly you lock the rotor.

CHAIRMAN RAY: I know it does. And that is my point. I am trying to find out how they did that.

MEMBER BONACA: I think notably this analysis, you assume that you have a flywheel -- the LOCA.

CHAIRMAN RAY: You have a what?

MEMBER BONACA: A loss of coolant. No not loss of coolant, I'm sorry, what you are looking for is the close down of the flow by which it goes down, and the DNB that results from it.

CHAIRMAN RAY: No I am talking about the actual mechanical force that is imposed on that joint. I had a 1,200 megawatt turbine rotor seize one time and you ought to see the damage it does. And I am just asking what we assume -- we are saying we can contain the missiles from the failure of the flywheel. Okay. The consequence of that is going to be a really torque placed on that joint momentarily.

And you know, so how does it get handled? One way I can think of maybe would be to have a keys or something which I thought you were talking about in which the motors actually keyed in to the bottom of the reactor coolant -- of the steam generator so that you are not depending on the sheer loading of those bolts to transfer the torque.

That would be one way. well, they are not up now. I am not --

MR. HONCHARIK: I mean there's other possibilities too, I mean a shaft could rupture, it could break, I mean you know, there are many possibilities.

DR. WALLIS: The shaft could break and it could keep going round.

MR. HONCHARIK: Right. And like they said, they did a locked rotor event as a design-based analysis.

CHAIRMAN RAY: Well, that's a thermohydraulic analysis. What effect -- at least as I understood it anyway -- but I am now saying okay you looked at what the effect is on reactor coolant flow. What's the effect on the mechanical joint between the reactor coolant pump motor and the steam generator?

DR. WALLIS: It depends a lot on the scenario.

CHAIRMAN RAY: It does. And I understand. But I am asking them. I can answer the question myself but I am trying to ask them what they assumed.

MR. HONCHARIK: I guess I am not clear. Are you talking here or --

CHAIRMAN RAY: I am talking that joint that you are pointing at right now.

MR. HONCHARIK: Right here?

CHAIRMAN RAY: Yes.

MEMBER BROWN: What he pointed to was the flywheel, the bolts. Are you talking about the pump casing joint where all the 18 bolts are?

CHAIRMAN RAY: Yes.

MEMBER BROWN: Okay well his finger was up in the other area that's why --

CHAIRMAN RAY: Well it's the joint that when you take it apart, and pull it out, you have got a hole in the reactor coolant system.

MEMBER BROWN: Yes, I see what you are saying.

DR. WALLIS: In an extreme case the pump falls off, the motor falls off, in the extreme case. Well it flies off. It comes off.

CHAIRMAN RAY: Yes.

MR. HONCHARIK: But now there are also bolts holding each one of these pieces down there along with the big bolts.

CHAIRMAN RAY: Okay.

MR. HONCHARIK: Okay. Thereby it's, it will restrict it from torque.

CHAIRMAN RAY: Well, fine, just tell me how you analyze it that's all I'm asking.

MR. HONCHARIK: Yes, along with the recess fits along the circumference.

CHAIRMAN RAY: The recesses I don't think transfer any torque at all, if I understand them correctly.

MR. HONCHARIK: So basically you are talking about just twisting -- the bottom part twisting along by itself

CHAIRMAN RAY: Yes, that's right.

MR. HONCHARIK: And I guess sheering off these bolts.

CHAIRMAN RAY: Well, or elongating them, plastically, so that you have now got the thing hanging at some angle and you have got a loss of coolant accident, yes. That's what I'm talking about.

MEMBER ARMIJO: Unless you do a

quantitative analysis it's just a guess, but I think that to me is the root cause has got to be addressed, in that whether it's -- and the root normally what we do in the materials area, we look for fractured mechanics and the way this pump is put together there is very good analysis of initial flaws and crack growth due to mechanical reasons.

But stress corrosion cracking is very, very specific to an environment and the best way we have always found to avoid surprises in this industry, is to test the material in the environment that it is going to operate in, even if it is unexpected. We have had lots of materials that we have tested and even then we have had surprises. So I just think if Westinghouse could show hey look, we have tested our 18 chrome 18 manganese in PRW primary water, even though we are protecting it, it's probably never going to leak, but if it does I still won't fail this pump by a stress corrosion crack.

And this has all the elements for stress corrosion cracking, a very high strength retainer ring. A lot of energy. A lot of stress put on that component in an untested material in the environment of record, and I think a potential that could exist unless you can show that you can inspect it periodically and prove that it is not leaking. Then I would be much more relaxed, but until you do one or the other, I think it is just-- it is not even consistent with what NRC practice has been, to require that materials be tested to make sure that they can meet the duty that could exist, environmental duty.

CHAIRMAN RAY: Okay so on the one hand we say it's okay if a missile is generated because it won't get out of the pump. On the other hand, we say but I really haven't looked at the mechanical loading on this joint that I am pointing at if such a missile were created that resulted -- well it's going to result in some torque being imposed because the motor is going to come to a pretty quick stop, I would guess.

And we haven't looked at it. And to me that's -- the only solution is either to inspect it like you do a flywheel on an existing pump like you said at the beginning, or like he wants, test it and say it's never going to fail, I don't need to inspect it.

MEMBER ARMIJO: I've got the right material for this environment, yes.

CHAIRMAN RAY: But this is neither one.

MR. HONCHARIK: I guess we won't even be

able to say that it never fail, just by doing that one test.

MEMBER ARMIJO: No, you do lots of testing. I'm not a big believer in one test. Okay?

MR. HONCHARIK: Oh okay.

MEMBER ARMIJO: You do lots of testing.

MR. HONCHARIK: You would have to do lots of tests before they could even use it.

MEMBER ARMIJO: For important components, sure. There's a danger of a nuclear incident.

CHAIRMAN RAY: Somehow you have either got to say it's not going to fail because I am going to inspect it or it is not going to fail because I know it's not going to fail or like you did, it doesn't matter if it fails. And I am just saying well okay, show me that it doesn't matter. And you know that's you can do that with regard to missile generation perhaps, but I don't see that we have done it yet with regard to the torque impact on that joint, on that mechanical joint, because that is a reactor coolant pressure boundary joint and man oh man you just don't disregard that, I don't think.

MR. WISEMAN: Mr. Chairman?

CHAIRMAN RAY: In a second. Anything more you guys want to say on this subject? Okay. Yes.

MR. WISEMAN: EMD has looked at the scenario that you are talking about.

CHAIRMAN RAY: I think you talked to me about it before.

MR. WISEMAN: And it hasn't been part of the submittal of the flywheel missile report or anything. It's a stress calculation that is required by the design spec.

CHAIRMAN RAY: Right.

MR. WISEMAN: So that is available. We can make that available.

CHAIRMAN RAY: Well we are going to have to somehow get closure on this. Now that doesn't satisfy Sam maybe, but I want to make sure if this thing comes to a sudden stop, it doesn't wind up coming off the bottom of the steam generator. We had this discussion before and I can't remember exactly what you told me but I thought you had looked at it and I am trying to ask them if they have looked at it.

So at this point I guess we will just either continue an open item or make an open item but somehow I want to be satisfied that what they did on this point is okay.

And I would like it to be okay with you but I can't tell them to send you something, so we will have to work out what to do.

Now do you guys have more to present on Chapter 5 maybe?

MR. HONCHARIK: Yes. Okay. Next is the Westinghouse to include carbon steel for the reactor coolant pressure boundary. Rev. 17 included proposals to include this carbon steel base material and the corresponding filler metals for these systems: the steam generator nozzles and tubesheets and pressure foragings for the reactor coolant pump.

Well, since the carbon steel is typically not used for reactor coolant pressure boundary parts, staff requested some justification for this change and its compatibility with the reactor coolant or to delete this use of the carbon steel.

Basically the response from Westinghouse clarified the use of the carbon steel. First the carbon steel would not be exposed to reactor coolant and also they have proposed to specifically identify those components that would use a carbon steel that are not exposed to the reactor coolant and these basically are the reactor coolant stator main flange, stator shell, and external heat exchanger supports. And none of those are in the path of containing the fly wheel.

Also the use of the carbon steel for the steam generator nozzles and tubesheets were proposed to be deleted. So based on these changes, the staff found that the use of the carbon steel for these limited applications would be acceptable. So this issue was resolved.

Next, the last issue of my talk is the Quickloc component which was proposed in Rev. 17. We had asked some -- requested some additional information be submitted for this new component and basically to summarize what we found out was that there are eight Quicklocs which replaced previous 42 individual penetrations on the reactor vessel head. And these are used for the Incore instrument assemblies. The Quickloc design has basically been used since `95 on five reactors as shown on the slides.

Next. This is a sketch of the penetration through the head. The bottom portion -- that's here -- basically the weld build up of alloy steel similar in composition to the reactor vessel head. This is a Quickloc instrument nozzle that is welded through some alloy 52 buttering and weld metal.

I'll just show you what this looks like.

DR. WALLIS: Is that a lining or something that seems to --?

CHAIRMAN RAY: Yes, it has got a cladding somewhere in there.

MR. HONCHARIK: This is also cladded with stainless steel and the Quickloc nozzle is stainless steel. So all exposed areas are clad in stainless steel.

MEMBER ARMIJO: Do favorable experiences use a same dissimilar metal welds and compositions as proposed here? You said there has been good experience in other reactors with this Quickloc and I am just asking is it exactly the same materials, the same buttering, all that stuff.

MR. HONCHARIK: Well I am going to get to that part.

MEMBER ARMIJO: Okay.

MR. HONCHARIK: It's basically the materials that in this part and on the next slide I will show you another picture where the mechanism -- this is the Quickloc nozzle and this is the Quickloc mechanism that holds the instrument penetrations and basically some of these parts are nitronic 60 which is stainless steel that is very good for galling purposes. And they have been used pretty readily in the industry.

It's good experience and I think that is what I am basically talking about. The ally steel weld buttering, I mean that's --

MEMBER ARMIJO: Pretty standard?

MR. HONCHARIK: Pretty standard.

MEMBER ARMIJO: Okay.

MR. HONCHARIK: So basically with this information the staff ind that the Quickloc design and the fabrication of it acceptable because the Quickloc design is fabricated to the ASME code section 3, and appropriate subsections and the materials used which basically are the nitronic 60 and stainless steel 304, 316, are compatible with the reactor coolant and have satisfactory operating experience.

And the fabrication inspections include volumetric examinations of all the welds and ensure their integrity. Next slide.

However, the staff did not agree with Westinghouse in that that weld build up of alloy steel which forms part of the reactor coolant pressure boundary and provides structural support for the instrumentation did not require in-service inspection.

So the staff's concern was that about the integrity of this weld during service. I would like to note that current operating plans that I have shown before that had this Quickloc design do not have that weld build up. They are basically welded to an existing penetration on the head.

So after the discussion with Westinghouse it was decided that a OL action item would be added to the AP1000 DCD and this item would state that COL would hold a 100 percent volumetric inspection every 10 years of this weld build up in accordance with Section 11 of ASME code, using acceptance criteria.

MEMBER ARMIJO: So the weld build up is the unique feature that you compared to the other plants?

MR. HONCHARIK: Yes.

CHAIRMAN RAY: It looks amazing to me that you would create that gigantic --

MEMBER ARMIJO: Why wasn't that just, well I'm not going to tell you how to build your reactor, but I am just --

MR. HONCHARIK: I cannot --

MEMBER ARMIJO: as opposed to a foraging or something that is welded to the vessel.

MR. HONCHARIK: I cannot do design but existing penetrations such as CRDs as you know use a J-groove weld which is a partial penetration fill it weld on the inside and they have their own experiences so I think this is one step in a direction that is a little better.

But hte only problem was how do we know that -- how this will react through the life cycle of this plant?

MEMBER ARMIJO: So you require inspections.

MR. HONCHARIK: So, right. So basically we found their proposed action to be acceptable because it included 100 percent volumetric inspection which is similar to other graphic coolant pressure boundary welds.

MEMBER BROWN: Do the other five plants do a periodic inspection at Calvert Cliffs?

MR. HONCHARIK: Yes. Because --

MEMBER BROWN: of the Quickloc?

MR. HONCHARIK: Yes, if you go to that picture again.

MEMBER BROWN: Is this just making that similar to those, that's the point of my question.

MR. HONCHARIK: Yes -- the other ones use a stiffening penetration so it's probably the J-groove weld.

CHAIRMAN RAY: They don't use the weld build up in other --

MEMBER BROWN: Where is the weld build up on this one? It's right in that area? Okay. All right. I got the difference.

(Simultaneous speaking.)

MR. HONCHARIK: They just inspect this weld, so Westinghouse then said well we are only going to inspect this weld, but we said okay what about this. So now they inspect everything, all the welds.

So basically with that we basically resolved that RAI issue and also I would like to note that COL applicant has already submitted information to address this item and right now we are reviewing it and pretty much almost done and I don't think there's no issues with it. They are going to augment their inspection ISI program.

CHAIRMAN RAY: Okay.

MR. HONCHARIK: And that concludes my presentation.

CHAIRMAN RAY: All right. Thank you. Questions for -- other questions.

MR. SISK: If I may perhaps provide some additional information on the locked rotor question that came up.

CHAIRMAN RAY: Can we come to that in a minute? Let me first see if there's anything else for these folks here.

MEMBER ARMIJO: I had one question and you didn't present anything on it and that was Westinghouse decided that they wanted instead of having very specific 300 series materials designations to have just a 300 series stainless steels, so it would allow the use of high carbon and stainless steels pretty much wherever they wanted to use it. And I know PWRs aren't as susceptible to IG-SCC as BWRs but it seems like it bothers me that we are moving away -- you know you still have a potential for weld sensitization. I know that PWR has hydrogen and uses hydrazine and all that stuff, but it seems like one of the benefits of using the low carbon variety steels is that it provides, in the event you don't know everything about the environment, it provides added margin against stress corrosion cracking and I just wondered how the staff about that.

You've had favorable experience with PWRs, you have not the BWR type IG-SCC, but you know is th staff really satisfied that this isn't kind of drifting away from material with lots of margin into a material that is maybe not so good. Just a general question for the staff.

MR. HONCHARIK: I guess you are right, it's better to err on the side of conservatism where it has used to lower carbon 304L for instance but also as you stated that PWRs really haven't had stress corrosion cracking problems for stainless steels and even most of their operating plants have a high carbon steel.

MEMBER ARMIJO: That's a thing I didn't know.

MR. HONCHARIK: Right. Most of them didn't use L grades, especially the older plants.

MEMBER ARMIJO: They were using .08 carbon?

MR. HONCHARIK: Right. Regular 304 stainless steel .08 carbon steel. And you know there's very, very few instances, there's nothing like the BWRs where they have that oxygenated environment, where they have stress corrosion cracking throughout, the recirc pipe and everything else, I mean there, that's a major problem also internals but for PWRs there's hardly any problems with --

MEMBER ARMIJO: So your justification is extensive operating experience and theoretical reasons the water chemistry is favorable.

MR. HONCHARIK: Right. Yes.

CHAIRMAN RAY: Anything else before I go to Rob?

MR. SISK: Mr. Chairman, I just wanted to kind of clarify, in the DCD section 5.4.1.3.6.2, rotor seizure, in the last two sentences of the second paragraph, and I will just read that very quickly, "The connection of the pump with the steam generator and discharge piping is analyzed for vibration of the pump, hydraulic effects and the torque due to the rapid slow down of the rotating assembly. The stresses on the pump casing, motor housing, steam generator channel head and piping are analyzed using ASME code section 3, service level D limit for this condition."

CHAIRMAN RAY: Okay. Well thank you. As I say I had previously understood that this was not something that hadn't been considered. The question at hand though is, because it is a complex analysis, whether the staff had reviewed the analysis. That was the question I was trying to get answered, and I am not sure what we are going to wind up wanting to do but I got the answer anyway, which was no.

I understand it is available. Huh?

MR. HONCHARIK: I guess I'd like to point out that I was only specifically involved with the flywheel analysis.

CHAIRMAN RAY: Okay. That's fine.

MR. HONCHARIK: There may have been --

CHAIRMAN RAY: May have been.

MR. HONCHARIK: NRC staff that looked at --

CHAIRMAN RAY: Fair enough.

MR. HONCHARIK: that other section of the DCD.

CHAIRMAN RAY: Fair enough. As far as I -- as far as any of us here know though, and I assume that Westinghouse would say if it were otherwise, we are not aware of any such review. Because it is complex and because it is a unique circumstance to have this, basically this large momentum being transferred through a primary coolant pressure boundary joint, it's an important question to have confidence we understand, because it would be really bad to have a -- we talked about cross channel flow and what effect it might have on DNBR and stuff, this is in that same league of are we confident that this thing isn't going to wind up the joint being damaged as a result of this event.

I did note that Rob referred to the thing slowing down. So yes, well --

MR. CUMMINS: It depends how fast.

CHAIRMAN RAY: It's sort of like -- so I just want to know if the slow down was satisfactorily, rigorously assumed. So we will have to try and probe that further. I don't think we can probably get any further here right now, but I don't want to attempt to have the ACRS review their work you know, whenever it hasn't been previously reviewed by the staff. I would prefer it get staff review which I think is a lot more competent than what we are likely to do.

So anyway we will ponder that some more and decide what it is we want to do about it. But at least I guess we have the facts straight. I appreciate the reference Rob.

Okay, now with that if we are done with Chapter 5, staff review of the DCD, the last item on our agenda today, is to review our upcoming interactions, that is looking ahead to the future and so if nobody has anything else we will take that up as our final item . I would appreciate everybody's input and participation so that we make sure there isn't something that is falling through the cracks here.

I know that the staff has a presentation planned but I wanted to start unless no -- they are going to do it. So that's better than me doing it which is to identify what the planned schedule and scope of our meetings is. So given that that is what your intentions are, go ahead Eileen.

MS. MCKENNA: Okay. Thank you. The agenda showed Ravi Joshi doing this and he had another -- when we planned to do this on the agenda he is not available so I will cover this material.

The first slide has the next couple of interactions and some of this I think we covered yesterday when we were going through some of the action item things but the --

CHAIRMAN RAY: So October 5 is Chapters 6 and 15.

MS. MCKENNA: Maybe I'll just talk from --

CHAIRMAN RAY: Yes, just talk from the -- hopefully everybody has got access to hard copy.

MS. MCKENNA: So yes the next one is --

MEMBER ABDEL-KHALIK: I will not be attending the October 5 meeting so hopefully the Chapter 6 issue that was raised regarding rivulet formation on the outside surface of the containment will be addressed by other members.

CHAIRMAN RAY: I turn to my colleague Professor Banerjee. Nothing has changed in the last few years. You are still planning on being here. Okay and --

Graham are you and Tom going to be here? All right. So I think Said will be ably represented.

MEMBER ABDEL-KHALIK: Right thank you.

CHAIRMAN RAY: Assuming we understand --

MEMBER BANERJEE: You are not going to be here?

MEMBER ABDEL-KHALIK: No.

MEMBER BANERJEE: Neither is Corradini.

CHAIRMAN RAY: It's going to be all on your shoulders and your able consultant associates'.

MS. MCKENNA: Okay.

CHAIRMAN RAY: And I will do what I can.

MS. MCKENNA: All right. We have --

MEMBER BANERJEE: It doesn't sound good.

(Laughter.)

DR. WALLIS: Are you going to get it clearer to us which parts of Chapter 6 we are going to have to look at?

MEMBER BANERJEE: Just GSI 191.

MS. MCKENNA: Again, the Chapter 6, I will remind you, the Chapter 6 is a chapter you have not seen before so it's all new information but I think the focus areas would certainly be -- some GSI 191 section, 621a and the second post would probably be the 6.4 control room ventilation. There are some other changes that are in that chapter but those two are the ones where there is something more unusual shall we say than okay we added a containment isolation valve type of changes.

So that's where I would suggest the

committee focus.

DR. WALLIS: We are looking at this change from the new shield building on the long term cooling with the natural convection?

MS. MCKENNA: That one part as I think I mentioned yesterday will actually be discussed in November rather than October.

DR. WALLIS: It's going to be in November?

CHAIRMAN RAY: Connection with the shield building itself.

MS. MCKENNA: Yes. Correct. But we still will have I think a very full day on October 5. There's a lot of topics to cover. We have offered a proposed agenda to Weidong and he can share that with you but again, I think there's probably more material than we can cover in a day so we put 15 at the end of the day because that's the one that if anything needs to carry over, that might be some of those action items on 15 that we may not get to depending on how long the committee is prepared to stay that day.

DR. WALLIS: Can I ask when do I have all the material I need to read in this short period of time?

MR. WANG: It's already in the CD I that I gave to you yesterday.

DR. WALLIS: Already in that disc that everything is in, they're not just GSI 191?

MR. WANG: It's everything for Chapter 6 and Chapter 15 and GSI 191.

CHAIRMAN RAY: Sanjoy do you know that Mike cannot prevailed upon to come if you should feel you would like to have him here? Is that something we need to work on?

MEMBER BANERJEE: I don't know.

CHAIRMAN RAY: Well he will be here tomorrow so let's try and --

MEMBER BANERJEE: I'm not here tomorrow. I'm leaving today.

CHAIRMAN RAY: That's correct. I will try and bend his arm tomorrow if that's what you would like.

MEMBER BANERJEE: He's here on the 30th for a NIAC meeting and I'm here on the 29th so he actually may not want to go back yes, he may not want to go back and then come --

CHAIRMAN RAY: Trust me, I'm going back to the West coast. I'm sure he is going to go back to Madison. It's a shorter trip. But in any event we will try, we will do what we can. Okay Eileen.

MS. MCKENNA: Okay after that the next two dates that we have for AP1000 design center are November 2, an all-day meeting, and November 3 a half-day and that would be for covering Chapter 9 and 19. We talked yesterday, it would include the aircraft impact which is part of Chapter 19 and hopefully we can tackle some of these action items in that period.

CHAIRMAN RAY: And reading will be available on November 1?

MS. MCKENNA: Yes. Yes.

CHAIRMAN RAY: Do you have a time yet?

MS. MCKENNA: No. Westinghouse, do you have an answer yet on what time you think on the 1st?

CHAIRMAN RAY: I only say that because one of our members -- we are meeting on the day and I got an email saying can I review this material before 8:30. That's a -- I wouldn't ask you to do that, so the question is --

MS. MCKENNA: When?

CHAIRMAN RAY: Were you planning on -- when were you planning to show up? Do you know?

MR. SISK: We are at the disposal of the staff and the committee.

CHAIRMAN RAY: Well all right. Let me just say at this moment I would say there may be some benefit to us the sooner the better on the 1st.

MR. SISK: That would be great.

CHAIRMAN RAY: All right.

DR. WALLIS: So this aircraft impact stuff, this will take something like an hour to look at will it at the end of the day? I am just figuring out when I have to be here on the 3rd.

MS. MCKENNA: Again I can't really speak to how long it would take you to look at a document. I don't know if you can -- Westinghouse can give me a volume of material.

CHAIRMAN RAY: Well let's try it this way. We have done it on another project and I think people were generally satisfied with an hour or so.

DR. WALLIS: But I don't have to come in early on the 1st?

MEMBER ABDEL-KHALIK: Well some people were and others spent four, six hours on it. So it just depends on who is available.

CHAIRMAN RAY: Yes, it will be available to you Graham if you get in early it will probably be useful.

DR. WALLIS: Yes, okay.

MS. MCKENNA: But the intent is obviously to have the presentation. This is just how much homework you want to do in advance.

CHAIRMAN RAY: Yes, well he's asking about homework.

MS. MCKENNA: Correct. I understand.

MR. SISK: Just for clarity, if I could, then what I am hearing for clarity is on the 2nd you would like us to come in at 8:30?

MS. MCKENNA: On the 1st.

CHAIRMAN RAY: On the 1st.

MR. SISK: I am looking at the schedule, I'm sorry. On the 1st at 8:30.

CHAIRMAN RAY: Yes.

MS. MCKENNA: Reading time so that when we hit the meeting on the 2nd, members have had the chance --

DR. WALLIS: I guess I have to ask again -- how late will it be available on the 1st? Does the staff go away and the material gets hidden or do we -- how late can we look at it?

MS. MCKENNA: Well I would have to talk with the ACRS staff about how we would handle that.

DR. WALLIS: I don't want to come here and find that I want to look at it and it is whisked away.

CHAIRMAN RAY: I think it is under the custody actually of Westinghouse.

MS. MCKENNA: Correct.

CHAIRMAN RAY: And so it is really up to them. We can -- the building is available. And I am sure the would be --

DR. WALLIS: That's the thing, I'm getting out ere, if I come in in the afternoon I don't want to start reading it and then find it is taken away.

CHAIRMAN RAY: Well we will do what we can.

DR. WALLIS: yes okay. So that will be clarified maybe?

CHAIRMAN RAY: No I am clarifying it for you. You can stay as long as you want.

DR. WALLIS: I can?

CHAIRMAN RAY: Yes.

DR. WALLIS: And the material will still be there?

CHAIRMAN RAY: I don't know. It depends on how reasonable it is when you start.

MS. MCKENNA: And then the second page is really a slightly longer term projection of the interactions. I will note that it does not reflect the anticipated full committee in November to talk about the long term cooling which is what we are going to cover in the subcommittee on October 5. That was an oversight in putting this table together. But it does show the additional days in November for Chapter 3 and what we call Chapter 23 which is really to --

CHAIRMAN RAY: What's the oversight? I missed it Eileen.

MS. MCKENNA: The full committee meeting in November on long term cooling, it's not -- I must have an old version of the slides then because mine didn't have it on there and I thought we had --

CHAIRMAN RAY: I thought these were your slides.

MS. MCKENNA: Well, I somehow had a different version of of it so I'm not sure quite how that happened so my apologies.

CHAIRMAN RAY: All right we will overlook that. Go ahead.

MS. MCKENNA: Apologizing for the oversight that wasn't there. So we do have the Full Committee then in November and then the December projected December Full Committee for the final letter which is our goal.

CHAIRMAN RAY: All right now is there more you want to say about this now updated ACSR interactions table?

MS. MCKENNA: The only thins is that the version I have it was also then showing that the later in December days to pick up Vogtle and summer chapters and then moving into January to do whatever Vogtle and summer remains after December. So that's the only difference I think on the --

CHAIRMAN RAY: Yes okay. I don't know how we got something added and something taken away I guess but. The present state of affairs is that on the matter discussed yesterday in the context of Chapter 7 was we wanted to see today if there was anything expectation we could have and I again stipulate that this at this point is outside the narrow scope of the amendment that we are considering on this track.

So assuming that for the moment at least, when might we have some dialogue with the staff on that subject?

MS. MCKENNA: Okay. I did discuss that with the staff and essentially they I think would be available whenever the joint committee could be convened.

CHAIRMAN RAY: Okay. So we will discuss that at the Full Committee meeting in October and try and tell you that we desperately need to assess that because we want to make sure we understand where it fits in the overall scheme of things.

Like I said at the moment we are assuming that it doesn't have implications for the amendment because that is what we have been told.

And so we will accept that but we want to run that to ground and in any case form some view very much like we anticipated the shield building which we haven't really seen yet but at least we got an informational meeting with the applicant in which I think people are much better prepared to address when it comes in November.

Now what about the vacuum breaker?

MS. MCKENNA: Okay the vacuum breaker, we had planned to have Westinghouse do an informational briefing in October based on the specific request and the staff would be prepared in November to give its conclusions on the design.

CHAIRMAN RAY: Okay so Full Committee in October. We have an information briefing is that right?

MS. MCKENNA: Yes you would have that to support that.

CHAIRMAN RAY: Okay. All right. So comments from members beyond what we have said already. I've said I'll try and get Mike to come if this is a big bunch of work for us. We have scheduled all of the times that we could find that we thought could be productively put to use here. But we may find that for example we need to squeeze in a subcommittee meeting immediately before the December full committee meeting if that becomes necessary due to issues either that aren't available as scheduled or which emerge during the discussion that we will be having.

We got a number of action items. I am rather concerned about the fact that t hey are not being reduced as much as I would wish. But that's the way it is. But if we strike them off prematurely that doesn't help anybody because at the end of the day we wind up with an unresolved issue.

And on the subject today of the -- I will call it the locked rotor. I don't want to confuse it with the hydraulic question on locked rotor. But the locked rotor Eileen, or the mechanical effects of the locked rotor I guess I would say, on the reactor coolant pressure boundary.

MS. MCKENNA: Actually yes, we were just, David and I, were just discussing that. He had done a little research while we were having this other discussion that the section that was referred to in the DCD is from Rev. 15 and it was presumably reviewed at the time of Rev. 15 and that the view is that the changes to the pump would not have affected at least that is the --

CHAIRMAN RAY: The results of the analysis is what you are going to say?

MS. MCKENNA: Yes.

CHAIRMAN RAY: All right but I still would like to know and I think it's a reasonable request to say was the -- was it reviewed at the Chapter 15 time?

MS. MCKENNA: Well Chapter 15, I --

CHAIRMAN RAY: I mean Revision 15.

MS. MCKENNA: Revision 15, I can't -- I have to assume it was but I'd have to go look at the SER to be able to say definitively what was reviewed or not reviewed.

CC. Okay. I guess I'll -- let's do it this way. I'm going to ask you to do that because it is a question that exists here now. I understand the argument that the changes that were made don't affect that. That's a debate that we can have later, whether that's true or not. I'll turn to Westinghouse and say my guess is we are going to want to look at the analysis that was referred to in the prior discussion that we had with you all and is referred to in the DCD reference you gave. We would like to see that, like to have it submitted to the staff but I can't tell you to do that.

Somehow we need to be assured that it's

sufficiently conservative and I am going to say at this point in time that because of the change that has occurred in the flywheel, that it's a reasonable thing for us to to take up here. I understand the arguments on the other side.

But that's where I will have to leave it. I think the easiest thing to -- the easiest way to address this Rob, is if you guys could make it available to us and I would like the staff to say it's something that they have looked at or would look at but if not, then we will look at it, okay?

MR. SISK: We will talk to the staff and see what we can do.

CHAIRMAN RAY: All right. And again my reasons for it are that it is just sufficiently important that from my standpoint at least, I would like to make sure that it got some review by the agency. If we have to do it, maybe we'll have to do it.

But one way or another it needs to be done.

And we have talked enough I guess about the issue of the flow skirt and the follow on questions that have to do with the analysis there. Trying to remember if there was anything else I haven't touched on.

MEMBER ABDEL-KHALIK: The third thing is the cooling on the outside of the --

CHAIRMAN RAY: Yes right, which is going to be taken up on the --

MEMBER ABDEL-KHALIK: It's going to be done as Chapter 6.

CHAIRMAN RAY: Chapter 6, yes, it's the air flow that's going to be taken up in the shield building discussion in November. That's where I was getting a little confused.

MEMBER ABDEL-KHALIK: The water flow uniformity and rivulet f0ormation impact on temperature distribution in the shield building as a result of non-uniform cooling and dry patch formation. That is something that has to be addressed.

CHAIRMAN RAY: Okay.

MR. SISK: I think that is what we heard.

CHAIRMAN RAY: Mario, anything you want to add to this to this effort to capture the two days?

MEMBER BONACA: Nothing to add.

CHAIRMAN RAY: Charlie?

MEMBER BROWN: I spoke my piece yesterday on my part and I will stop there.

CHAIRMAN RAY: All right, well listen, on the full committee meeting in October, let's do try and get an opportunity for you to share your views with the two principal colleagues not here who would be of interest to that and see what their take on it is. That will be done off line not as part of any of our meetings.

MEMBER BROWN: I outlined a way to try to present it in a semi-understandable manner. I've asked Weidong for the electronic version of the slides so that might help me put that together and I will try to have something together so we can talk about it at that time.

CHAIRMAN RAY: All right. Said?

MEMBER ABDEL-KHALIK: I have no additional comments.

CHAIRMAN RAY: Sam?

MEMBER ARMIJO: It just crossed my mind that it might help put this question about the materials on the pump and that retaining ring to bed. That there is two research programs, one sponsored by EPRI one sponsored by the NRC. The NRC was called a proactive materials degradation program where experts in the industry sat down to sort of predict or anticipate where materials failures could occur and avoid surprises.

That was the idea of the proactive. And they came up with a matrix of environments and materials where we knew very little about it but the consequences of materials failure could be high.

And EPRI had a similar but different program again trying to help the industry avoid materials degradation or failures that are surprises as compared to all the well-known stuff. I think it would certainly put my mind at ease if the staff talked to the research people in NRC, maybe you already have, just to ask them, get your guys together, is this a very low risk based on everything you know, your experts, or not and the same with the EPRI guys, they have a lot of expertise in this area.

And they do have an active program. I don't know who is sponsoring it, the owners' group or just an EPRI program, but I'm sure you have access to that.

Yes a materials reliability program and that could just kind of put this to bed.

CHAIRMAN RAY: Yes from the standpoint of my concern, we have got to say this is not going to fail even though I don't inspect it. And if you are prepared to say that then I'll be a lot more content than I am now.

Sanjoy?

MEMBER BANERJEE: I'm fine.

CHAIRMAN RAY: Graham?

DR. WALLIS: No.

CHAIRMAN RAY: Tom?

DR. KRESS: Nothing extra.

CHAIRMAN RAY: All right thank you everybody, we got through this two day agenda just about on time. We will hereby adjourn.

(Whereupon the above-entitled matter adjourned at 4:37 p.m.)

Presentation to the ACRS Subcommittee

Vogtle Units 3 and 4 COL Application Review

SER Chapter 18
Human Factors Engineering

September 20 – 21, 2010

Staff Review Team

- Technical Staff
  - Paul Pieringer
- Project Management
  - Anthony Minarik

Overview

- Chapter 18 of the Standard Content SER with Open Items was issued with no Open Items
- All sections are IBR except:
  - 18.2 HFE program management
  - 18.6 Staffing and Qualifications
  - 18.8 HSI Design
  - 18.10 Training Program Development
  - 18.14 Human Performance Monitoring

Section 18.2 HFE program management

- VEGP COL information Item 18.2-2 – HFE design of the EOF and TSC
  - COL Information item was incomplete in DCD revision 16
  - Needed clear documentation that COL still had some HFE design responsibilities for the EOF
  - ITAAC ensure Integrated System Validation.
- Resolution – The COL applicant committed to establish the TSC and EOF in accordance with NUREG-0696. This NUREG includes HFE design guidance

Sections 18.6, 18.10, and 18.14

(slide 3 for titles)

- Applicant addressed the standard COL information items in these sections.
- Standard content in Bellefonte SER was referenced.
- For section 18.6, site-specific plant operating experience was provided.

Section 18.8 HSI Design

- Tier 2 departure – location of TSC and OSC
  - Does not effect HFE Design
  - OSC is not in HFE program scope
  - Location is specifically addressed in Section 13.3 of the FSER

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Presentation to the ACRS Subcommittee

AFSER Chapter 5
Reactor Coolant System and Connected Systems

Westinghouse AP1000 Design Certification Amendment Application Review

September 20-21, 2010

Staff Review Team

- Technical Staff
  - John Honcharik – Component Integrity
  - Neil Ray– Component Integrity
  - John Wu – Mechanical Engineering
  - Gene Hsii – Reactor Systems
  - John Budzynski – Reactor Systems
- Project Management
  - Perry Buckberg

Overview

- Chapter 5 of the AP1000 DCA SER with Open Items (OIs) was issued with a total of 4 Open Items
- Three RAIs Issued After the SER w/OI was Issued
  - All Open Items & RAIs are Resolved
  - Open Items Being Presented
    - **OI-SRP 5.4.1-CIB1-01**
  - RAIs Being Presented
    - RAI-SRP 5.2.3-CIB1-01
    - RAI-SRP 5.2.3-CIB1-03

OI-SRP 5.4.1-CIB1-01

- Open Item
  - Include flywheel materials used in flywheel analysis in DCD.
- Prior to proposing to include the flywheel materials in the DCD, Westinghouse proposed a material change to RCP flywheel outer hub, and other changes that may impact the flywheel analysis.
- The following will discuss these changes.

OI-SRP 5.4.1-CIB1-01

Reactor Coolant Pump Flywheel

- Previous Flywheel Materials:
  - Heavy tungsten inserts with Type 403 Stainless steel inner hub and 18-Ni maraging steel outer hub.
  - Alloy 625 outer shell
  - Flywheel analysis performed for the above materials
- Proposed Material Change:
  - 18Mn 18Cr alloy Steel (ASTM A 289, Grade 8) outer hub
- Proposed 18Mn 18Cr material not included in flywheel analysis.
- Therefore, need to demonstrate flywheel does not generate a missile.

OI-SRP 5.4.1-CIB1-01

Reactor Coolant Pump Flywheel Analysis

- New flywheel analysis used similar methodology as previous analyses.

- Other factor accounted for in the new flywheel analysis:
  - Dimensional changes to the flywheel
  - Additional pump part (stator closure ring)

OI-SRP 5.4.1-CIB1-01

Revision 15

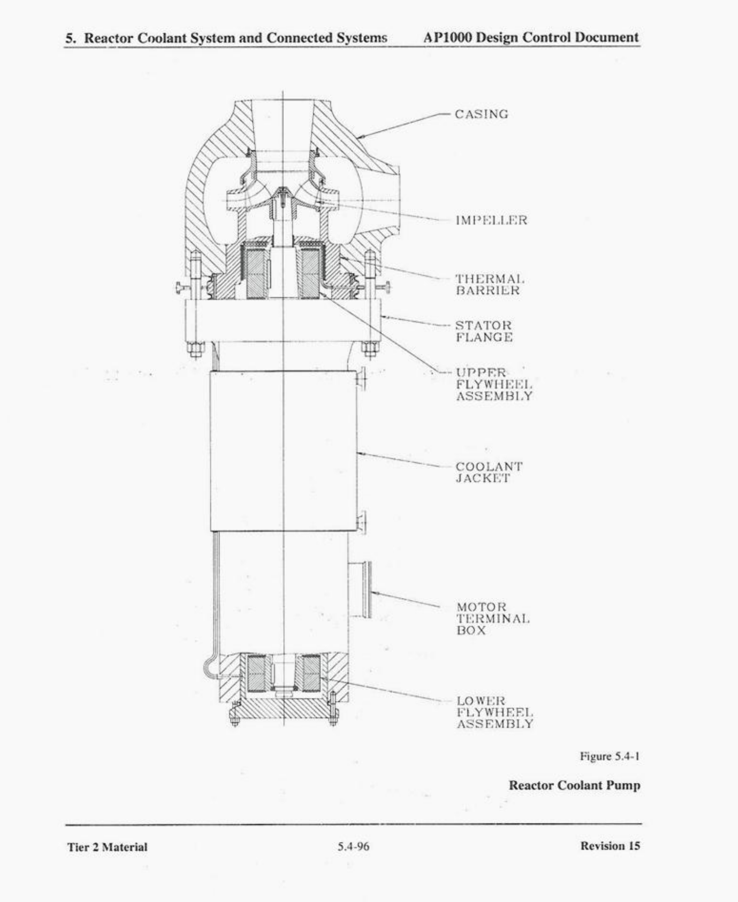
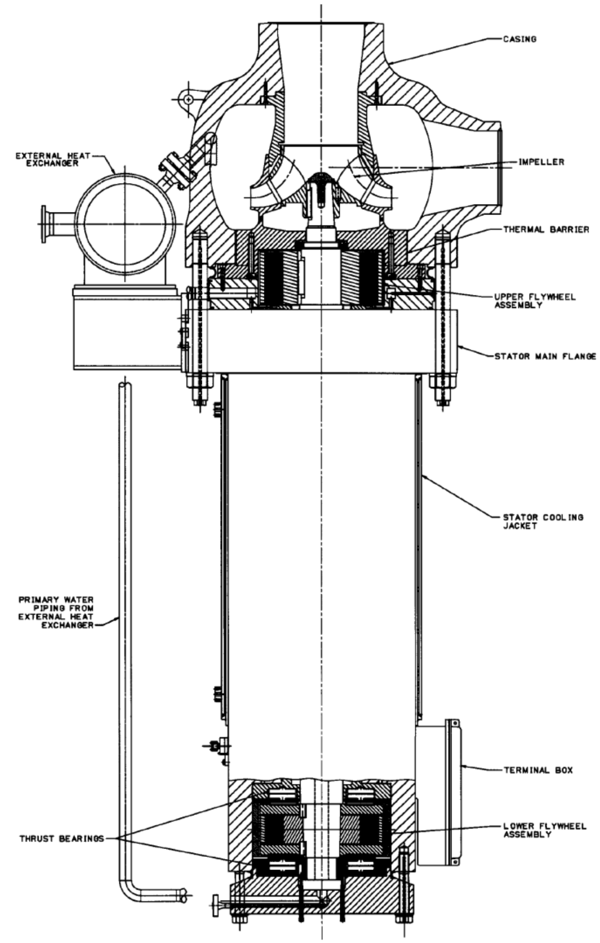

5. Reactor Coolant System and Connected Systems AP1000 Design Control Document

Figure 5.4-1

Reactor Coolant Pump

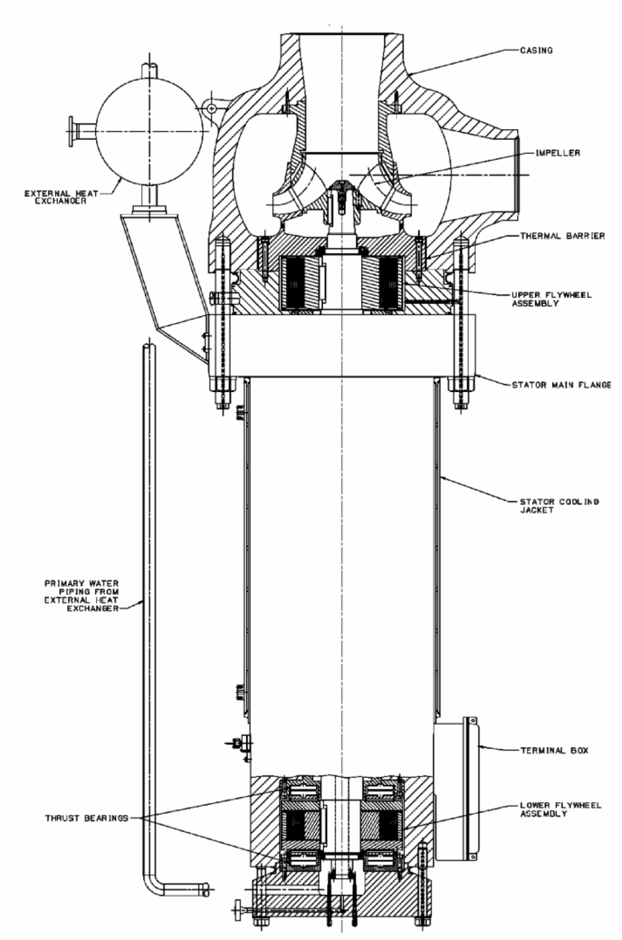
Tier 2 Material 5.4-96 Revision 15

Current

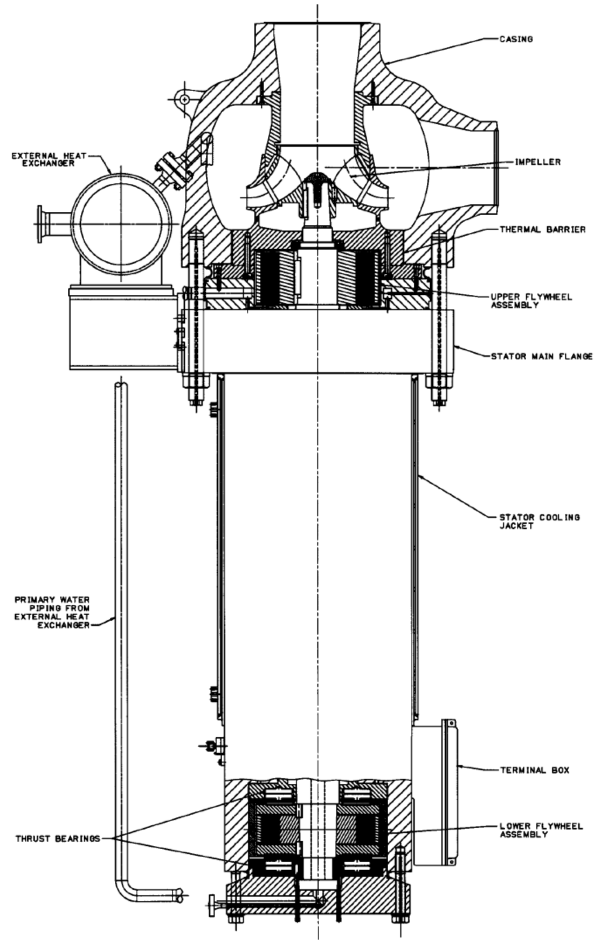


OI-SRP 5.4.1-CIB1-01

Revision 16



Current



OI-SRP 5.4.1-CIB1-01

Reactor Coolant Pump Flywheel Analysis

- Analysis was conservative:
  - Used material properties of 18Mn 18Cr material (lower yield strength) and accounted for dimension changes of flywheel and pump.
  - Used only a portion of the entire volume of the pump thickness adjacent to the flywheel to contain a postulated fractured flywheel.
  - Upper flywheel containment boundary accounted for bolted pump parts.
  - Analysis demonstrates flywheel does not generate missile.

OI-SRP 5.4.1-CIB1-01

Reactor Coolant Pump Materials

- Pump Parts:
  - Stator main flange, stator shell and external heat exchanger supports were changed to include the option for carbon steel. Acceptable since they are not exposed to reactor coolant.
- Flywheel
  - 18Mn 18Cr outer flywheel hub acceptable. Satisfactory operating experience of material in aggressive stress corrosion environment for steam turbine generator .
- All issues associated with the Open Item are resolved.

RAI-SRP 5.2.3-CIB1-01

- RAI (Reactor Coolant Pressure Boundary Materials)
  - Staff requested that Westinghouse delete the proposed addition of carbon steel base material and corresponding filler material (ASME Code Filler Metal Specifications SFA 5.1, 5.17, and 5.22)**,** or provide further justification**.**

- The proposed additions consisted of:
  - Option to use carbon steel (SA-508, Grade 1) for:
    - steam generator nozzles and tubesheet
    - pressure forgings for the reactor coolant pump.
  - Included corresponding carbon steel filler material (SFA 5.1, 5.17, and 5.22)

RAI-SRP 5.2.3-CIB1-01

Reactor Coolant Pressure Boundary (RCPB) Materials

- Westinghouse clarified and proposed changes to the DCD so that the use of carbon steel and the corresponding filler materials only apply to:
  - Pressure boundary components not exposed to reactor coolant.
  - Specifically identified the components that can use carbon steel (i.e., reactor coolant pump – stator main flange, stator shell and external heat exchanger supports) which are not exposed to reactor coolant.
  - Deleted the option for the steam generator nozzles and tubesheet.
- These changes are acceptable and resolve the RAI.

RAI-SRP 5.2.3-CIB1-03

- RAI
  - Staff requested that Westinghouse discuss the QuickLoc component specified in AP1000 DCD, FSAR Figure 5.3-1. Provide a summary of this information in the DCD.

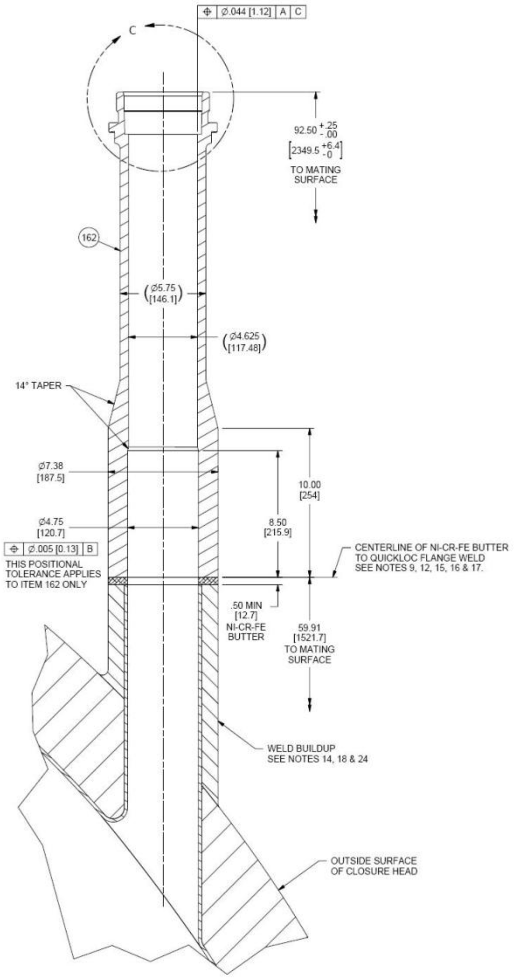
RAI-SRP 5.2.3-CIB1-03

<u>RCPB Materials - Quickloc</u>

- Previous DCD revision had 42 individual penetration on the reactor vessel head for the Incore Instrument Thimble Assemblies.
- Quickloc design changes replaces these 42 penetrations with 8 Quickloc instrument nozzles.
- Satisfactory operating experience since 1995 on 5 reactors:
  - Waterford, Unit 3
  - St. Lucie, Units 1 and 2
  - Calvert Cliffs, Units 1 and 2

RAI-SRP 5.2.3-CIB1-03

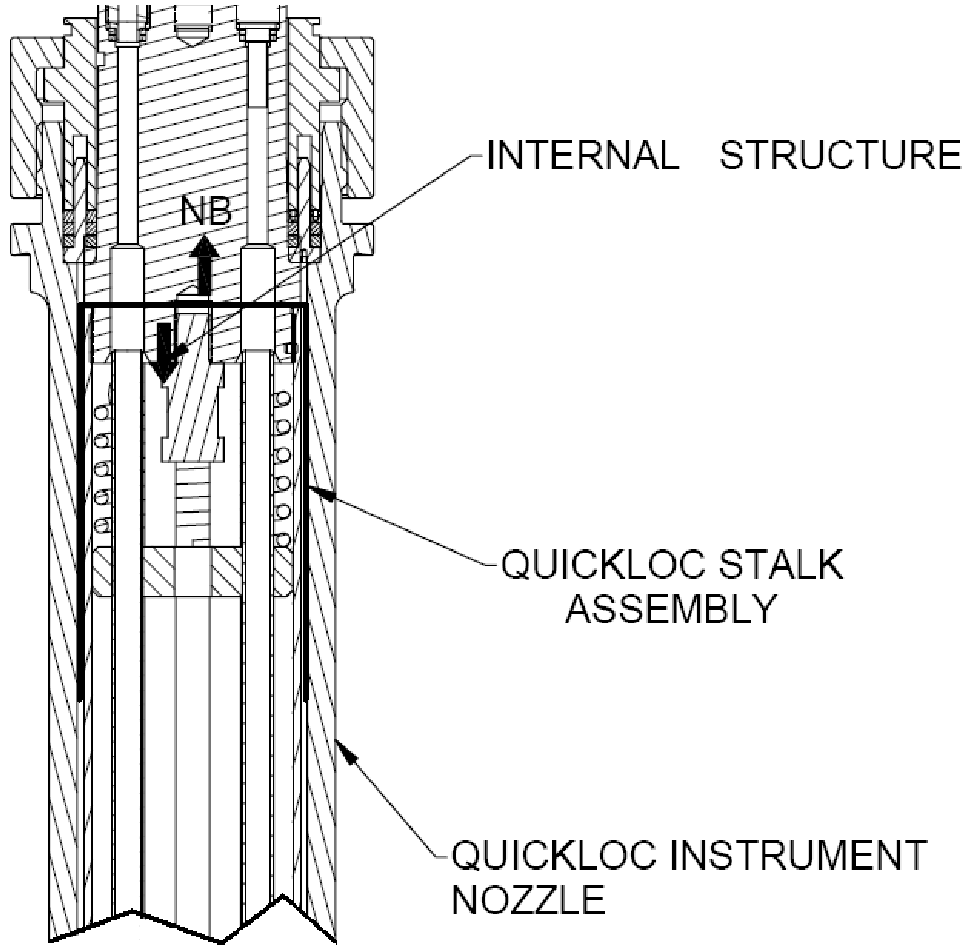
Quickloc Penetration in reactor vessel head



DETAIL B - STEP 2
TYPICAL 8 PLACES
SCALE 4/12
(SHEET 1)

RAI-SRP 5.2.3-CIB1-03

Quickloc Mechanism attached to penetration on reactor vessel head



RAI-SRP 5.2.3-CIB1-03

<u>RCPB Materials - Quickloc</u>

- Staff finds the Quickloc design and fabrication acceptable, based on the following:
  - Quickloc is designed and fabricated to ASME Code, Section III (Subsection NB for pressure boundary and Subsection NG for non pressure boundary internal parts).
  - Quickloc uses materials that are compatible with reactor coolant and have satisfactory operating experience in the current reactors.
  - Inspections during fabrication include volumetric examinations of all welds to ensure the integrity.

RAI-SRP 5.2.3-CIB1-03

RCPB Materials - Quickloc

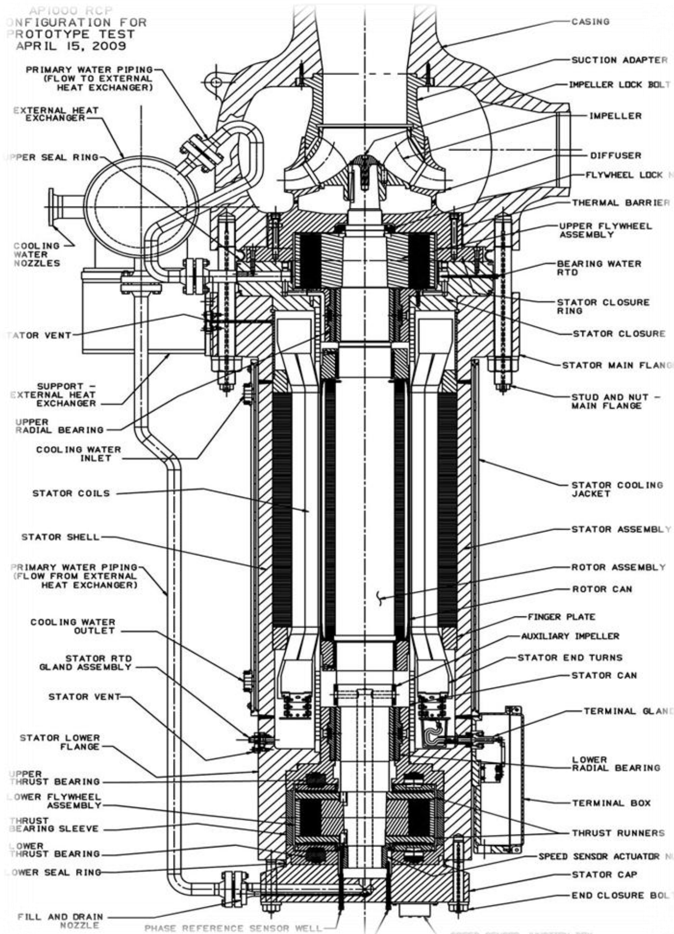
- Staff did not agree with the proposal that the weld buildup of the Quickloc nozzle (which forms the reactor coolant pressure boundary) did not require future inservice inspections to be performed.
- NRC staff were concerned about ensuring the integrity of the weld buildup during the service.
- Based on the staff's concern, Westinghouse proposed a COL action item which would specify that the COL holder would include a 100% volumetric examination of the weld buildup every ten years using the acceptance criteria in ASME Code, Section XI.

RAI-SRP 5.2.3-CIB1-03

<u>RCPB Materials - Quickloc</u>

- Staff finds the inservice inspection for the Quickloc weld buildup acceptable, based on the following:
  - Volumetric inspection is performed every ten years, similar to other pressure boundary welds.
  - Inspection will ensure weld integrity of the reactor coolant pressure boundary is maintained, which meets GDC 30 and GDC.
- These changes are acceptable and resolve the RAI.
- Note: COL applicant has submitted information on this COL action item to include the inspection in their ISI program. The staff is currently evaluating the information.

OI-SRP 5.4.1-CIB1-01



Presentation to the ACRS Subcommittee

Upcoming ACRS Interactions

Eileen McKenna, Branch Chief (AP1000 Projects)
Jeffrey Cruz, Branch Chief (AP1000 Projects)

September 20-21, 2010

Upcoming ACRS Meetings

- Near term interactions (tentative)
  - October 5, 2010
    - ➢ DCD Chapters 6, and 15
  - November 2 and 3(AM), 2010
    - ➢ DCD Chapters 9, and 19

ACRS Interactions

Date	Topics(s)
October 5, 2010 Advanced FSER Presentations	Day 1 AP1000 DCD Chapters 6, 15
November 2 and 3 (AM), 2010 Advanced FSER Presentations	Day1 AP1000 DCD Chapter 19 (including AIA) Day 2 AP1000 DCD Chapter 9 and ACRS Action Items
November 4-6, 2010 ACRA Full Committee	long-term cooling (Chapter 6 , GSI-191)
November 18-19, 2010 Advanced FSER Presentations	Day 1-2 AP1000 DCD All Chapters and 1, 3,and 23 ACRS Action Items
December 2-3, 2010 ACRS Full Committee	Days 1 and 2 AP1000 DCD All Chapters