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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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AP1000 REACTOR SUBCOMMITTEE MEETING

OPEN SESSION

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FRIDAY,

NOVEMBER 19, 2010

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ROCKVILLE, MARYLAND

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The Advisory Committee 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.

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1 COMMITTEE MEMBERS:

2 HAROLD B. RAY, Chairman

3 J. SAM ARMIJO, Member

4 SANJOY BANERJEE, Member

5 DENNIS C. BLEY, Member

6 MARIO V. BONACA, Member

7 CHARLES H. BROWN, JR., Member

8 MICHAEL T. RYAN, Member

9 WILLIAM J. SHACK, Member

10

11 NRC STAFF PRESENT:

12 BRIAN ANDERSON, NRO/DNRL

13 JOHN BUDZYNSKI, NRO/DSRA/SRSB

14 RALPH LANDRY, NRO/DSRA

15 EILEEN MCKENNA, NRO

16 JOHN MCKIRGAN, NRO

17 KENNETH MOTT, NRO/DE/ICE1

18 WILLIAM A. ROGGENBRODT III, NRO/DE/ICE2

19 WEIDONG WANG, Designated Federal Official

20

21

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1 PRESENT FROM WESTINGHOUSE:

2 CHUCK BROCKHOFF

3 RUSTIN BURGER

4 ED CUMMINS

5 JOHN EWALD*

6 CESARE FREPOLI*

7 MEGAN GENUSKE

8 JEFF HIMLER

9 MICHAEL LAMBERT

10 MIKE MELTON

11 WARREN ODESS-GILLETT*

12 RICK OFSTUN

13 TERRY SCHULZ

14 BOB SEELMAN

15 ROB SISK

16 MARK STELLA*

17 YIXING SUNG*

18

19 ALSO PRESENT:

20 THOMAS S. KRESS, ACRS Consultant

21 GRAHAM B. WALLIS, ACRS Consultant

22 BOB HIRMANPOUR, NuStart

23

24 *Present via telephone

25

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

(1:17 p.m.)

CHAIRMAN RAY: We'll go on the record.
And the floor is yours.

MR. ANDERSON: Thank you, Mr. Chairman.

4. CHAPTER 23 GAS INTRUSION, PCS AIR VENTS

MR. ANDERSON: My name is Brian Anderson.
I'm a Project Manager in the Division of New Reactor
Licensing. The next series of presentations from the
staff will be related to the staff's chapter 23, the
safety evaluation report. This chapter contains the
staff's evaluation of design changes that were
submitted by Westinghouse in accordance with the
guidance of ISG-11.

With me on the panel are some of the
technical staff members that were involved in the
staff's evaluation of these proposed design changes.
John Budzynski is a technical reviewer in our Reactor
Systems Branch. Hien Le is a technical reviewer in
our Technical Specifications Branch. And Michelle
Hayes is a technical reviewer in our Containment
Systems Branch.

CHAIRMAN RAY: I understand why you only
have some of them up there because we've got a lot of
changes to consider here, don't we?

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1 MR. ANDERSON: That's right. Just to
2 provide a little bit of an overview to chapter 23
3 before we get into some of the technical discussion
4 and as a follow-up to some of the information that
5 Westinghouse provided earlier.

6 Chapter 23 is an SER that has not been
7 previously presented to this Committee, has not been
8 issued as an SER with open items, but it was issued in
9 late October as an SER without open items.

10 Chapter 23 evaluates most of the proposed
11 design changes that Westinghouse submitted to the NRC
12 staff following rev. 17 of the DCD and not attached to
13 or connected to any previous RAI or open item.

14 In addition, the staff's evaluation or
15 proposed design changes address those that satisfy one
16 or more of the criteria of ISG-11. ISG-11 is the
17 guidance for finalizing licensing basis documents. In
18 Westinghouse's presentation, you saw that referred to
19 as the freeze points of the design.

20 And, in part, ISG-11 describes types of
21 changes, categories of changes, that should not be
22 deferred until after the issuance of the design
23 certification rule.

24 The categories of those changes are listed
25 on the slide in front of you. They include items like

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1 the correction of significant errors and significant
2 technical corrections associated with the design.

3 And if there are no questions in that --

4 CHAIRMAN RAY: Well, contrast it with
5 something that can be deferred, just as an example.

6 MS. McKENNA: This is Eileen McKenna.
7 There are changes that perhaps the applicant
8 identified as an improvement, you know, to give it
9 more flexibility in procurement. And they originally
10 had included some of those when they first started
11 talking about these post-17 changes.

12 And based on our workload and other
13 considerations, we really asked them to focus down on
14 those that had to be done. One example that I can
15 speak of, think of off the top of my head, there was a
16 change.

17 They wanted to change from a -- I may get
18 this backwards -- a gold valve to a gate valve. And
19 it happened to be written that way in the DCD. And
20 that was a change they wanted to make, but it didn't
21 meet one of these criteria. So we said, "Take that
22 one off the table." So it was that kind of thought
23 process.

24 CHAIRMAN RAY: All right. But these are
25 not things that then can be done without processing an

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1 amendment, then. Is that correct?

2 MS. MCKENNA: Then it would be up to the
3 COL through the departure process to evaluate them --

4 CHAIRMAN RAY: I see. All right. Okay.

5 MS. MCKENNA: -- to see whether they could
6 do them without approval or they would require
7 amendment.

8 CHAIRMAN RAY: So it's not a matter of,
9 well, let's buy off on this amendment at this point in
10 time and then we'll expect another one coming in the
11 door shortly.

12 MS. MCKENNA: We don't expect these other
13 ones to come as an amendment. If they happen, they
14 would be departures.

15 CHAIRMAN RAY: I see. All right.

16 MR. ANDERSON: Yes. The first technical
17 presentation the staff is going to make is related to
18 changes that were proposed for the passive core
19 cooling injection lines. The Committee had received
20 presentations on this issue at least once in the past,
21 Westinghouse presentations, but the following slides
22 are for the staff's presentation.

23 MR. BUDZYNSKI: My name is John Budzynski.
24 And I did the technical review of the changes to the
25 passive cooling system injection lines. And basically

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1 what we did is we had the capability to vent
2 unconvincible gases from those lines. And we added
3 approximately eight valves, manual valves, that will
4 allow them to vent the gases is what it does.

5 This system is basically the same as that
6 they have for the CMT, where they have a pipe stub and
7 a probe that's put in there that determines the level
8 indication. And when the gas builds up to a point
9 where the water no more -- the probe is no more
10 submerged in the water, then you get an indication in
11 the control room and locally. And when that happens,
12 they have time to go out and enter the containment
13 room and vent it.

14 And these valves are located where they
15 can enter the containment room but at full power
16 conditions. So it makes them easy. They can get them
17 when they want to. Also, they added tech specs
18 conditions.

19 There are actions to this in modes 1
20 through 4. There were two actions. If one of them is
21 alarm, they have I think 24 hours to vent it. And if
22 both of them are alarm, they have eight to get one of
23 them into a vented condition and repair.

24 Basically I didn't see any problems with
25 this going through. And since a previous was already

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1 approved in the pervious one for CMT and also for the
2 passive heat RHR system, they also have just basically
3 the same setup and seem to be pretty big coincidence.

4 CHAIRMAN RAY: Okay.

5 MR. BUDZYNSKI: Any questions?

6 CHAIRMAN RAY: I don't think there are
7 questions. Go ahead.

8 MR. BUDZYNSKI: Okay. The conclusion, we
9 did the AP1 design testing. And NRC staff -- we base
10 part of this on historical data that confirmed that
11 the test can demonstrate that a passive safety
12 injection systems are not susceptible to any adverse
13 effects from gas heat intrusion. It's very minimal.

14 But the applicant decided to put these in
15 place and also that the AP1000 passive safety systems
16 are not susceptible to pump-related problems, as they
17 do in an active system. So there would be no gas
18 binding, as you would see in a system with pumps. And
19 the water primer effects would be a lot less.

20 If it was invented, they did notice a
21 little bit of flow instability but insignificant.

22 CHAIRMAN RAY: All right. If that makes
23 sense? Thank you.

24 MR. ANDERSON: The staff's next
25 presentation is related to the proposed design changes

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1 for the classic containment cooling system. This
2 follows with Westinghouse's presentation from before
3 lunch.

4 MS. HAYES: I'm Michelle Hayes from the
5 Containment Branch, here to talk about the enhanced
6 shield building changes to the PCS.

7 As Westinghouse mentioned in their
8 presentation this morning, there is an increased
9 resistance in the air flow path in the enhanced shield
10 building. And, as a result, the air velocity
11 decreases, as does the cooling capability of the
12 natural circulation air flow path, which led
13 Westinghouse to reduce the air-only cooling limit,
14 which led them to increase the thermal capacity of the
15 spent fuel pool, which led them to change the
16 direction of the flow, taking flow away from the
17 PCCWST so that it's available from the PCS so that
18 it's available for the spent fuel pool post-72 hours.

19 The first two changes impact normal
20 operations. So the associated tech specs were
21 revised. I want to point out that the impact of these
22 changes on the spent fuel pool was included in the
23 chapter 9 discussion that you guys hand the end of
24 October. So we're not going to get into those here.
25 I'll just be focusing on the PCS.

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1 Next slide. During the design
2 certification, Westinghouse referenced a series of
3 tests to qualify the AP1000 PCS evaluation model.
4 That's the WGOthic modeling process.

5 They went back and looked at all of these
6 tests that they used: the integral test and the mass
7 and heat transfer test. And the only one that was
8 impacted by the changes to the shield building was the
9 air flow characterization test. So they and redid
10 that. And, as expected, the flow pressure drop
11 increased with the new design.

12 Westinghouse incorporated the revised
13 shield building with the more restrictive flow path
14 into the NRC-approved WGOthic model and performed
15 several analyses.

16 The first analysis demonstrated the new
17 design, had negligible impact on the peak containment
18 pressure and temperature during their design LOCA and
19 MSLBs, which we would expect because the water
20 provides a much more significant evaporative cooling
21 than does the air flow.

22 The next two items were air-only cooling
23 events, which we saw a big difference in. And
24 Westinghouse demonstrated that the PCS water is not
25 required for the containment shell when the reactor

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1 heat is less than six megawatts, which is different
2 than the nine megawatts that was in the previous
3 design, and that the containment shell would not fail,
4 even if water is unavailable for 24 hours. This was a
5 beyond design basis accident. And it's consistent
6 with the current PRA assumptions. So chapter 19 is
7 unaffected by this change.

8 The final analysis demonstrated that some
9 of the post-72-hour cooling water reserved for the
10 containment shield may be redirected to the spent fuel
11 pool if the reactor is in refueling. If the reactor
12 is not in refueling, the current DCD-specified flow
13 rate of 100 GPMs applies.

14 Next slide.

15 DR. WALLIS: Are you satisfied that 88 GPM
16 will cool the containment effectively, that the way
17 it's distributed and all of that will work?

18 MS. HAYES: We did audit. Go the next
19 slide. I'm going to address that on this next slide,
20 that we did an audit of the analysis and found the
21 assumptions were conservative. For this particular
22 case you're talking about, the PCS flow is reduced to
23 80 GPM. The staff found the analysis acceptable
24 because the WGOOTHIC model used the evaporated limited
25 flow.

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1 DR. WALLIS: How do you know it's all
2 going to evaporate?

3 MS. HAYES: As opposed to? The way they
4 do that, evaporation --

5 DR. WALLIS: Flowing down in rivers and
6 not evaporating.

7 MS. HAYES: And Megan could help me out
8 here. The way they do that evaporation-limited flow,
9 I mean, that process was what was approved in the SER.
10 And I didn't really get into how they --

11 DR. WALLIS: So it's okay because it's
12 been approved before?

13 MS. HAYES: The process? No. That's part
14 of it. And the next part of it is they had a huge
15 margin. Even with 65, they still had like 39 psi.

16 DR. WALLIS: As long as it all evaporates?

17 MS. HAYES: Sixty-five evaporates. And
18 they're not putting 65 on there. They're doing an
19 iterate process.

20 DR. WALLIS: Does it all evaporate is the
21 question. I mean, if it --

22 MS. HAYES: No. The value that they put
23 in the model is less than 65. It's what they iterate
24 evaporates.

25 DR. WALLIS: Were you here for our

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1 discussion earlier about --

2 MS. HAYES: I heard your discussion this
3 morning. And there was a lot of references to
4 previous discussions. I didn't know what you were
5 talking about there.

6 DR. WALLIS: Okay.

7 CHAIRMAN RAY: Let me try it this way.
8 Supposing you put the water on the containment shield
9 and it were to run down in such a way that it didn't
10 evaporate enough to meet these heat removal
11 assumptions. Just imagine that situation.

12 MR. McKIRGAN: If I could? Mr. Chairman,
13 this is John McKirgan for the staff.

14 CHAIRMAN RAY: Yes. Just let me try for a
15 minute.

16 MS. HAYES: Okay. So it's not removing
17 the six --

18 CHAIRMAN RAY: Yes. It's just running
19 down, but --

20 MS. HAYES: It's not removing the heat in
21 containment 100 hours after. We're also going to go
22 with there was so much margin. The design pressure
23 was only getting up to less than 40. And you have up
24 to 80.

25 CHAIRMAN RAY: Well, that's right if --

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1 MS. HAYES: There was something grossly
2 different in our assumptions that would account for --

3 CHAIRMAN RAY: Yes. The assumption is
4 that you evaporate enough water to remove the heat.

5 MS. HAYES: Yes.

6 CHAIRMAN RAY: I'm just trying to have you
7 imagine with me that the water flows over the surface
8 in such a way that that doesn't happen. Can you
9 imagine that?

10 MS. HAYES: It's not going to evaporate.
11 It's just not going to perform a --

12 CHAIRMAN RAY: That's right.

13 MS. HAYES: It's just all grouped together
14 and you go down into the --

15 CHAIRMAN RAY: Right, exactly. Yes.

16 MEMBER BANERJEE: So think of this. You
17 have distributed one GPM for the six feet, one GPM.
18 When you open your faucet, you get about four GPM. So
19 if you really think of it physically, one GPM is a
20 little dribble of water. This is being distributed
21 over six feet. Think of it physically. It has to all
22 come down as a uniform film.

23 MS. HAYES: I'm not talking about one GPM.

24 MEMBER BANERJEE: I'm talking about --

25 MS. HAYES: I'm talking about 80 GPM.

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1 MEMBER BANERJEE: No. One GPM over six
2 feet.

3 PARTICIPANT: A segment.

4 CHAIRMAN RAY: Six feet is --

5 MS. HAYES: Oh, okay. I'm just --

6 MEMBER BANERJEE: Think of it physically.
7 It's like a little thing running out of your faucet.
8 It has to be evenly distributed over six feet. Do
9 you really think it's -- what do you think will
10 happen? That's the problem with looking at GOTHIC and
11 not actually running the faucet and seeing.

12 MS. HAYES: Right. And I did not spend a
13 lot of time looking into how they qualified the
14 WGOthic flow.

15 MEMBER BANERJEE: I'm not talking about
16 flow. I'm just saying, is it reasonable?

17 MR. McKIRGAN: Mr. Chairman, if I could?

18 MS. HAYES: Well, I don't --

19 CHAIRMAN RAY: I'm going to ask you to
20 wait just a little bit longer.

21 MEMBER BANERJEE: That's reasonable.

22 MR. McKIRGAN: I'm going to ask the staff,
23 Michelle, not to speculate. If you did not do this
24 review, please do not speculate.

25 MR. BERGER: This is Rusty Berger from

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1 Westinghouse. Would it help if we talked about the
2 evaporation-limited technique just to give you guys an
3 understanding of how we model that or a discussion,
4 whatever --

5 CHAIRMAN RAY: Well, the staff is up now.

6 And I think we tried to help. When the staff members
7 said they couldn't understand it, we tried to get them
8 to understand it. But now we are --

9 MEMBER BANERJEE: You understand --

10 CHAIRMAN RAY: We're going to stop now.

11 And we're not even going to try and get you to
12 understand it because I guess that involves
13 speculation.

14 So go ahead with whatever you want to say.

15 MS. HAYES: Based on the margin, I found
16 the post-72-hour flow and the way they did it was
17 consistent with the way they have done it in the
18 previous revisions.

19 And then we also ran for confirmatory
20 analysis using the CONTAIN model. And we also put the
21 flow on and assumed the same distribution as we had
22 assumed in the previous and got the same results as
23 Westinghouse. And so we concluded the proposed
24 changes were compliant with the relevant DCDs and also
25 the 10 CFR 50.47 that requires you to have testing

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1 supporting the passive plant design.

2 I am done.

3 CHAIRMAN RAY: There's nothing that we can
4 say, I guess.

5 MR. ANDERSON: That concludes our
6 presentations for this conference.

7 CHAIRMAN RAY: Thank you.

8 Well, all right. We're back to
9 Westinghouse, are we? Are we going to continue with
10 your discussions?

11 MS. MCKENNA: Yes, Mr. Chairman. What I
12 tried to do with the agenda was kind of give a couple
13 of changes by the applicant, a couple of changes by
14 the staff, rather than five changes and --

15 CHAIRMAN RAY: Yes. That's fine.

16 MS. MCKENNA: -- so they wouldn't get so
17 intermingled. So we are going to go back to the
18 applicant for --

19 CHAIRMAN RAY: Yes. Well, I understand.
20 I mean, I think that it's difficult, though, when
21 we're trying to communicate with the staff and get
22 them to understand how we're trying to ask the
23 question to have them be told that they can't respond
24 to us.

25 Just I don't know what to do. I guess we

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1 just have to put it in writing is the only thing I can
2 think of.

3 MR. McKIRGAN: Certainly, Mr. Chairman.
4 And I think, as you alluded before, the issues there
5 were resolved in rev. 15. And the staff does not
6 review issues that were not part of the amendment.

7 CHAIRMAN RAY: That's fine. Anybody can
8 make that observation. I can. The staff can. But
9 the question had -- the point was we are trying to
10 imagine how under this amended design the film
11 behaves. And we were trying to have a dialogue with
12 the staff on that subject. But we'll give up and,
13 like I say, put it in the letter, I guess.

14 5. CHAPTER 23 ITEMS - VACUUM RELIEF, CCS ISOLATION

15 MR. MELTON: Okay. We're going to present
16 on change notice 74, containment vacuum relief system.
17 And then after that, we have another one on the
18 containment cooling system.

19 CHAIRMAN RAY: Okay.

20 MR. MELTON: Chuck Brockhoff is going to
21 lead the discussion on this. I'm going to go open up
22 a conference line. Please give me one minute.

23 CHAIRMAN RAY: All right.

24 MR. BROCKHOFF: Yes, sir. This is for
25 chapter 23W, containment vacuum relief system. And

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1 your handouts are coming around right now.

2 This is a diagram that shows a vacuum
3 relief system was added. What I wanted you to do was
4 kind of look at that diagram. And I'll go through the
5 second slide, which is an overview of what the changes
6 were.

7 Fundamentally we added -- using existing
8 purge exhaust penetration, we added outside of
9 containment two parallel butterfly-operated valves and
10 inside containment two parallel check valves that are
11 balanced check valves opened with a slight pressure.

12 And in the right conditions, we basically
13 take outside air and use it to pressurize containment
14 in a situation where containment pressure is
15 decreasing. And I'll talk about what that condition
16 is. So, anyway, you can take a look at this.

17 So normally this is a purge exhaust that
18 goes out to relieve if you were purging containment to
19 exchange air. So when we use that, this would
20 normally be closed. And it's only opened
21 intermittently of power for containment pressurization
22 changes potentially.

23 In the event that you have a design basis
24 event, these valves are actuated. And we'll talk
25 about that in a minute. They open. And with the

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1 pressure differential, the check valves open under
2 pressure. And these also become by the design
3 containment isolation valves. So we'll look at that.

4 So that was the addition. So, with that in hand, if
5 you would look, I will go through and talk about
6 specifically what the changes were.

7 We identified a containment over cooling
8 event that required the addition of this system in
9 looking at our design. And, consequently, we added a
10 six-inch vacuum relief-sized system that's shown on
11 the other drawing.

12 The schematic of these meets the ASME
13 section 3 criteria, NE 771.52, for a vacuum relief
14 device for the containment vessel itself. So it's
15 designed to be consistent with that. And, actually,
16 as I'll show you later, it's similar to the
17 configuration of current plants that have the steel
18 shell containment like we do.

19 Because it is a containment isolation
20 valve with a specific function, we added a tech spec
21 for this that's equivalent to the standard tech spec
22 36-12. So it's not fundamentally different.

23 The arrangement is, as you have seen in
24 the other drawing, two MOV butterfly valves. They're
25 class 1E butterfly valves with an actuation signal to

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1 open a vacuum relief. They also have a dual function
2 to close when we need containment isolation. And
3 they're single failure-proof.

4 And then the check valves are inside
5 containment. Since these are active valves, they're
6 added to the active valve list, table 39-12. And they
7 have in-service testing appropriate to the active
8 function plus the containment seat leakage
9 requirements for this. So it's no different than any
10 other containment isolation valve.

11 They do automatically open class 1E
12 batteries. The actuation signal is a low-pressure and
13 containment below the normal operating band, which is
14 an indication that we have a negative pressure forming
15 containment. So they have a safeguards actuation
16 signal that becomes a tech spec 3-32 actuation,
17 safeguards actuation, surveillance.

18 The arrangement for the I&C is that the
19 vacuum relief has priority over containment isolation.

20 And the way to think about it, they don't really
21 mutually exist because if you had a condition with low
22 decay heat on a cold day, you had an event that had
23 very low decay heat, you wouldn't have any
24 pressurization in containment that you might need with
25 a blackout condition, the flow of air into containment

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1 to equalize pressure.

2 Eventually when the pressure went up high
3 enough in containment that the release of
4 radioactivity was a challenge, you would have the
5 containment low-pressure signal clear. And then the
6 automatic isolation signal would take precedence and
7 close the valve. So you don't really have a condition
8 where you need both at the same time, just by the
9 process that exists.

10 So we have the I&C lodging set up to have
11 actuation with priority of isolation because the
12 vessel under-pressurization is a design basis concern
13 in that case.

14 The design basis event is basically a cold
15 front that overcools. And it can be an existing cold
16 front that's there and we have a reactor trip or we
17 have a plant design basis accident. So that we may
18 need this depending on what conditions are in
19 containment from the event.

20 The containment vessel design external
21 pressure is now established as -1.7 based on service
22 level A and D conditions. So it changed from the
23 existing condition.

24 DR. WALLIS: You mean that's the limiting
25 allowable pressure or something?

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1 MR. BROCKHOFF: Yes. Yes, sir.

2 DR. WALLIS: Yes because --

3 MR. BROCKHOFF: We have to turn the
4 pressure before it gets onto that negative pressure
5 limit. And our system does --

6 DR. WALLIS: This is where a new -- you
7 actuate these valves at -1.7 psi, too?

8 MR. BROCKHOFF: We actuate them at about
9 -.5 or .8. What's this? I forget, but it's a slight
10 negative pressure. And then it turns. The pressure
11 will go down and turn before it gets to the minimum
12 pressure.

13 DR. WALLIS: That's the minimum that's
14 allowable.

15 MR. BROCKHOFF: This is a design pressure
16 for the vessel, -1.7.

17 DR. WALLIS: Okay.

18 MR. BROCKHOFF: So that replaces a value
19 that was existing in the DCD.

20 And then we currently have again this same
21 valve arrangement for both CE two-loop designs and
22 Westinghouse two-loop designs and have a steel shelf
23 containment like we do. It's basically a butterfly
24 valve and a check valve series.

25 And this is single failure-proof. If you

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1 look at the drawing, it's single failure-proof for
2 either one to open here or single failure-proof for
3 either one to open in the other side.

4 And the last thing is, in looking at this,
5 this was a fairly extensively work change on our end
6 and also extensively reviewed by the staff.

7 We looked at the transient analysis, which
8 is the chapter 6 analysis. The system design looked
9 at many, many aspects. We put in safety-related
10 valves. They were containment isolation. They needed
11 in-service testing. They were active valves. They
12 needed tech specs associated with them. They needed
13 the actuation circuitry, which is another tech spec.

14 So we did lots of design aspects. We
15 looked at the sizing to see what size pipe and valve
16 we needed. And we had to really work in conjunction
17 with the assumed safety analysis case of what the
18 transient was.

19 We had to look at ASME code considerations
20 because this is a protection device for the vessel.
21 And we also had to look at the CV shell design and
22 obviously make sure that we come up with a new -1.7
23 design basis number.

24 We looked at --

25 MEMBER BLEY: You said you don't have to

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1 worry about a conflict between the vacuum breaker and
2 the containment isolation. Physically that makes
3 sense, but what if you get a low containment pressure
4 signal, a false one. Will the ESF override that?

5 MR. BROCKHOFF: It's a two of four logic.

6 MEMBER BLEY: Two of four? Okay. So it's
7 as any safeguards actuation signal would be. There's
8 a coincident logic to conclude that.

9 But, anyway, this is very broadly studied.

10 We basically put together a critical issue resolution
11 team to really look and make sure we broadly touched
12 everything that was needed. And then we had a very
13 extensive staff interface on this. They asked us
14 various questions in each of these areas. And we have
15 gone back. And I think we have closed it to their
16 satisfaction, all the question that we have had.

17 I actually wanted to show you one backup
18 slide just to give you a sense of this. Typically if
19 we have any safety valve, we typically affect the tier
20 1 ITAACs, which includes the valve, the lines, the
21 figure, and the criteria acceptance table if there was
22 a difference in the valve from other standard valves.

23 The tables in tier 2 that are affected,
24 there are equipment classification lists, the seismic
25 equipment lists, active valve lists, in-service

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1 testing, qualification, high-frequency sensitive
2 electrical equipment for the valve and actuator if it
3 has position sensing, containment mechanical
4 penetrations, PANs indication because valve status is
5 there, P and IDs for the affected system, safe
6 shutdown components in chapter 9.

7 And then this one was a little different.

8 If safety valve has actuation logic, it also affects
9 7.2, 7.3, manual actuation, and the tech specs. So we
10 really broadly cover this across the DCD and look
11 really extensively at each of these areas.

12 Let me flip back again. And, apart from
13 those, we also looked at the discussion associated
14 with this change for the transients in chapter 6 and
15 for the information on the containment in chapter 3.
16 So it was very broad.

17 CHAIRMAN RAY: Go to that last table
18 again, Chuck, the backup slide. Yes. I mean, this
19 illustrates -- you know it already; that's why you put
20 it up there -- how many things are affected by a
21 single change and --

22 MR. BROCKHOFF: By one valve, one safety
23 valve.

24 CHAIRMAN RAY: Correct. And that's what
25 makes reviewing amendments in the form of all of those

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1 changes individually so difficult, particularly when
2 you mix them up with another 60 or so changes.

3 MR. BROCKHOFF: Right.

4 CHAIRMAN RAY: But, anyway, that's just a
5 gratuitous observation. It's where we started this
6 process. It sort of got bogged down. I think this
7 chapter 23 approach has some obvious advantages from a
8 reviewer's standpoint anyway.

9 MR. BROCKHOFF: It's a very systematic
10 look. You need to do that with each change, identify
11 all the --

12 CHAIRMAN RAY: All right. Any questions
13 about the late addition of a vacuum breaker? I can
14 call it that, can't I?

15 DR. WALLIS: It's a very slow transient,
16 isn't it? It's hours and --

17 MR. BROCKHOFF: Well, it's about 15
18 minutes until we actually need it to actuate. It
19 really depends on the temperature you assume. And it
20 also depends on the rate of change of pressure, of
21 temperature in a given hour. So it's, yes, a
22 relatively slow transient compared to the ones you
23 typically think of.

24 DR. WALLIS: And you looked at the extreme
25 conditions of the outside temperature and all that

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1 sort of thing?

2 MR. BROCKHOFF: Yes, sir. We looked at
3 down to the -40, which is our limiting chapter 2
4 condition.

5 DR. WALLIS: Okay. Thank you.

6 CHAIRMAN RAY: Yes. I guess one other
7 thing occurs to me, Chuck. And that is that the check
8 valve on the inside needs to open easily.

9 MR. BROCKHOFF: It has a balancing feature
10 on it.

11 CHAIRMAN RAY: Right.

12 MR. BROCKHOFF: This has been used in many
13 plants and about two inches of water gauge, I believe,
14 is the set point.

15 CHAIRMAN RAY: What I am thinking about is
16 the extent to which it is able to pass the
17 surveillance test in the other direction. I'm sure
18 you've looked at that and thought about it and --

19 MR. BROCKHOFF: It has to be leak-tight,
20 just like any containment isolation valve must be.

21 CHAIRMAN RAY: Yes, I know. And because
22 it doesn't have a high seating force by definition,
23 that can be problematic.

24 MR. BROCKHOFF: Well, it's a six-inch
25 valve. So you get some seating force based on a

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1 differential pressure. At 59 ponds pressure in
2 containment with a six-inch valve, that's a
3 substantial closing force.

4 CHAIRMAN RAY: I know, but you had better
5 have the seats very carefully --

6 MR. BROCKHOFF: Yes, sir.

7 CHAIRMAN RAY: -- lapped or you're not
8 going to get anywhere. I've had it happen. So,
9 anyway, it's painful to go up into mode 2 and have to
10 turn around and go back down again two or three times
11 because you can't get these valves to seat, not these
12 valves but valves like them.

13 MR. BROCKHOFF: Valve in particular.
14 That's right.

15 CHAIRMAN RAY: Valve that doesn't have a
16 strong seating force. If there's any problem with the
17 valve fully seating, you can't pass the test. And it
18 can be a problem.

19 Okay. Thank you.

20 MR. BROCKHOFF: Yes, sir.

21 MR. MELTON: Great job.

22 MR. BROCKHOFF: Thanks.

23 MR. MELTON: Mark Stella, are you on the
24 phone?

25 MR. STELLA: Mark Stella is on the phone.

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1 MR. MELTON: Okay. Thank you, Mark.
2 We're getting started on the changes to the
3 containment cooling water system.

4 Okay. Mr. Chairman, this is Michael
5 Lambert. He's our senior engineer. And he'll make
6 this presentation.

7 CHAIRMAN RAY: All right. Thank you,
8 Mike.

9 MR. LAMBERT: Okay. AFSE 23.V. The
10 reason for the change -- go to the next slide. The
11 reason for the change, the external heat exchanger
12 tube leak or rupture results in the discharge of
13 reactor coolant. Go to the reactor coolant pump and
14 then to the containment cooling water system.

15 There is no isolation of the pump cooling
16 lines to the external heat exchanger pulse. And this
17 will be illustrated on the next slide.

18 The automatic closure of the CCS
19 containment isolation valves occurred only on a
20 safeguards signal, a signal which is a low pressurizer
21 pressure. The safeguards signal may not have occurred
22 for an extended period, allowing continued leakage of
23 reactor coolant into CCS and out of containment into
24 the turbine building.

25 The maximum RCS discharge rate was greater

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1 than 100 gallons per minute in a single pump makeup
2 rate of 130 gallons per minute. Protection from the
3 reactor coolant pump heat exchanger tube rupture was
4 only by non-safety SSCs.

5 CHAIRMAN RAY: Why? Was this just an
6 oversight or what? I mean, was there a different
7 philosophy that somehow came out with a different
8 answer? I'm trying to figure out why this was ever
9 designed the way it was.

10 MR. LAMBERT: I don't want to misspeak,
11 but I believe that the reactor coolant pump design is
12 new. And in that design being done, this is just
13 something that we came about.

14 CHAIRMAN RAY: So this inner system
15 failure wasn't possible with the old design?

16 MR. LAMBERT: It wasn't the same
17 mechanism.

18 MEMBER BLEY: I'm remembering something
19 when they went back through the reactor coolant pumps.
20 And I'm not --

21 CHAIRMAN RAY: Yes. Eileen?

22 MS. McKENNA: I think the addition of the
23 external heat exchanger was a rev. 17 or 16 change
24 before it was internal. So I think that's one of the
25 things that led to this scenario and then maybe -- I

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1 don't know.

2 I can't speak to whether there was a
3 change in the size of the coolant system, but I think
4 it's the external heat exchanger change that throws
5 post-certification.

6 CHAIRMAN RAY: Yes. I guess I'm still
7 trying to puzzle over -- I mean, it isn't an idle
8 question. I'm really trying to understand this.
9 Whether it's internal or external to the pump casing,
10 I don't see that that makes any difference in terms of
11 this protection.

12 Yes? Does somebody want to enlighten us?

13 MR. STELLA: Yes. This is Mark Stella. I
14 work in the BOP Engineering Group, the same group that
15 Mike works in. Let me see if I can explain this.

16 The reactor coolant pump is cooled by this
17 external heat exchanger. And it always has been
18 designed to be cooled by an external heat exchanger,
19 the major part of the heat being taken out from the
20 standard cooling water system.

21 At the time the pump was designed, we
22 didn't really have any good information on the
23 configuration of the external heat exchanger, not
24 knowing the size of the tubes, the number of the
25 tubes, and things of that nature.

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1 Once all of this got defined as the pump
2 design progressed, we started doing the analyses and
3 assumed a single double-ended guillotine break tube
4 failure. Originally we thought that the tubes would
5 be sized so that we would not exceed 100 GPM loss from
6 the reactor coolant system and that would make it not
7 a LOCA by the normal definition. It's the same as
8 having a three-eighths inch orifice in a line
9 connected right to the reactor coolant system.

10 That allowed us to utilize non-safety
11 manual operator action to isolate this event because
12 there was sufficient time to detect it and to take
13 action manually from control room to isolate the pump
14 before there was a significant release of radiation
15 from the --

16 CHAIRMAN RAY: All right. Thank you. I
17 got it. Very good. Appreciate it.

18 MR. MELTON: Thank you, Mark.

19 CHAIRMAN RAY: Okay. I didn't mean to cut
20 you off, but I do understand now what happened. Thank
21 you.

22 MR. STELLA: Now, there was one other
23 complicating factor in that as the pump design
24 developed, we found that we needed to protect the
25 pumps against damage by overheating by tripping them

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1 all if there were a loss of cooling water or some
2 other event that caused a high temperature in at least
3 one of the pumps. So to trip all of the pumps, we had
4 to trip the reactor at the same time.

5 So we had to introduce an automatic
6 reactor trip on high bearing water temperature, which
7 essentially ended up giving us a situation where we
8 had loss of reactor coolant through the CCS outside
9 containment and the reactor trip. So that put us into
10 the new category of event and caused us to have to
11 rethink the entire method for isolating the pumps.

12 MEMBER ARMIJO: What is the maximum
13 temperature that you allow these coolant pumps to get
14 to?

15 MR. STELLA: I believe the trip set point
16 is about 185 degrees Fahrenheit right now. That's
17 based on information from the latest series of reactor
18 coolant pump tests. Any time we reach 185 degrees
19 Fahrenheit and it was standard cooling circuit at the
20 location of the bearing water temperature sensors,
21 which is high in the pump, close to the thermal
22 barrier, it will generate a trip --

23 MEMBER ARMIJO: So that would be the
24 hottest --

25 MR. STELLA: -- in the reactor coolant

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1 pumps.

2 MEMBER ARMIJO: That would be the hottest
3 point in the pump?

4 MR. STELLA: Actually, the hottest point
5 is above the seal. That's the hottest point in the
6 pump that would damage the bearings or cause
7 degradation to the motor windings. So that's why --

8 MEMBER ARMIJO: Okay. I've got it.

9 MR. STELLA: -- it's placed there.

10 CHAIRMAN RAY: All right. Good answer.

11 Thank you.

12 MR. MELTON: Thanks, Mark.

13 We're on the next slide.

14 MR. LAMBERT: This slide is a picture of
15 the reactor coolant pump. Mike, can you zoom in from
16 this top section?

17 CHAIRMAN RAY: You're going to have to do
18 something. Speak really loud --

19 MR. LAMBERT: Okay.

20 CHAIRMAN RAY: -- or turn toward us when
21 you're pointing or something.

22 MR. LAMBERT: The reason for what this
23 slide is showing is that the cooling circuit where the
24 cooling water comes out of the pump and goes to the
25 heat exchanger and then returns from the heat

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1 exchanger back to the pump, there's no place for
2 isolation valves in that line. That's where we can't
3 isolate it in the event of a tube break. We can't
4 isolate the RCS flow path into the CCS system.

5 One more point. The bearing temperature
6 sensors are in this area up here. So they are near
7 the hot end of the pump.

8 This next slide shows the configuration of
9 the CCS lines going into and out of the reactor
10 coolant pump heat exchanger, the cooling circuit.
11 This system is the same for all four pumps. And what
12 this shows is originally this check valve was intended
13 to close to prevent backflow in the event of a tube
14 rupture.

15 And then we had an automatic isolation
16 valve on the outlet side. It would also close if you
17 had a coincident flow deviation alarm of reduced flow
18 on the inlet and increased flow on the outlet. And it
19 was protected by a non-safety relief valve. So this
20 is still the reason for the change that we are going
21 over.

22 Next slide. The changes that we made to
23 correct this, the change incorporates automatic
24 isolation of the CCS containment penetrations
25 following a reactor coolant pump external heat

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1 exchanger tube rupture with safety-related SSCs only.

2 We use a safety-related RCP bearing water
3 high temperature trip signal to produce an isolation
4 signal, which is independent of the S signal. And it
5 provides new safety clash relief valves inside
6 containment near the isolation valves to ensure their
7 operability and continued integrity following the tube
8 break.

9 These next two slides simply show the
10 changes that we made. If you can see, the relief
11 valve V270 is what was added. And this is the
12 containment, the CCS containment, supply line. So
13 V201 is the containment isolation check valve. And
14 V200 is the containment isolation automatic valve.
15 And the note 7 that was added is the closure of that
16 valve on the high bearing water temperature trip
17 signal. And this next slide shows the same changes
18 made to the containment return line.

19 V271 is the safety relief valve added.
20 And then you can see note 7 is the closure of the
21 automatic isolation valves V207 and V208.

22 MEMBER ARMIJO: Let's see. Where is D,
23 the discharge of the relief valve?

24 MR. LAMBERT: It goes to a drain. So it
25 will eventually go to the containment sump.

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1 MEMBER ARMIJO: Okay.

2 MR. LAMBERT: Following the changes in the
3 event of an external heat exchanger tube rupture
4 safety class, RCP bearing water temperature sensors
5 produce the reactor trip followed by the trip of all
6 four RCPs. The pump trip signal is used to produce
7 automatic closure of CCS containment isolation valves.

8 The isolation of the reactor coolant
9 leakage outside containment is accomplished entirely
10 with safety-related SSCs. The high bearing
11 temperature sensors PMS system and safety class
12 isolation valves and safety class relief valves
13 protecting those isolation valves. The high bearing
14 water temperature condition occurs within minutes for
15 an external heat exchanger tube leakage at rates as
16 low as ten gallons per minutes. And the changes will
17 be included in DCD rev. 18.

18 CHAIRMAN RAY: Any questions?

19 MEMBER ARMIJO: Yes. Could you go back to
20 slide 3, your drawing? Could you blow that up a
21 little bit?

22 MR. LAMBERT: This one?

23 MEMBER ARMIJO: Yes.

24 MR. LAMBERT: Okay.

25 MEMBER ARMIJO: Up near the flywheel. Is

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1 that 185-degree temperature max? Is that the actual
2 temperature of the flywheel? It looks like not much
3 cooling up there.

4 MR. LAMBERT: Yes. The temperature
5 elements are in this area. That's --

6 MEMBER ARMIJO: It's the bearings you're
7 worried about. So is the flywheel at the same maximum
8 temperature, 185, or not?

9 MR. LAMBERT: I can't answer that with any
10 certainty.

11 MR. STELLA: Mike, may I try to answer
12 that?

13 MR. LAMBERT: Sure.

14 MR. STELLA: This is Mark Stella again.

15 The flywheel, the upper part of the
16 flywheel, actually operates at a relatively high
17 temperature, probably in the area of 300 degrees --

18 MEMBER ARMIJO: That's what I thought.

19 MR. STELLA: -- because of the conduction
20 through the thermal barrier. The temperature drops
21 off through the flywheel itself. And down below the
22 flywheel, I would say the flow temperature is probably
23 in the 200-degree range. That fluid is mixed. It
24 mixed a chamber with the fluid coming up from the
25 rotor itself, from the standard cavity, in a mixing

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1 chamber.

2 And in that mixing chamber, there are four
3 RTDs, four sensors arrayed 90 degrees apart to measure
4 the fluid for that mixing chamber. And the
5 temperature, 185 is the Prandtl mixed temperature of
6 the fluid coming down from above and the fluid coming
7 up from the motor.

8 MEMBER ARMIJO: Yes. Just looking at your
9 drawing, it seems you have a cooling path at the
10 bottom of the flywheel seal can. And so that would be
11 cooler than the top of that seating can that contains
12 the tungsten and the retainer rings. You might have
13 --

14 MR. STELLA: That is correct.

15 MEMBER ARMIJO: Okay. So there will be a
16 temperature gradient, but the hottest part might be
17 about 300?

18 MR. STELLA: Yes. The hottest part is
19 definitely above. And the heat generated up there by
20 friction and coming through the thermal barrier is
21 transferred down along the side of the rotating
22 flywheels through the series of vortices into the
23 lower part of the flywheel, where it mixes and then
24 goes to the heat exchanger.

25 MEMBER ARMIJO: Okay. Thank you.

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1 CHAIRMAN RAY: Any other questions?

2 (No response.)

3 CHAIRMAN RAY: Okay. Now, Eileen, did you
4 want the staff to respond to these, too, or --

5 MS. McKENNA: Yes. We have a staff
6 presentation on these two changes --

7 CHAIRMAN RAY: All right.

8 MS. McKENNA: -- because we thought they
9 were the more significant ones.

10 CHAIRMAN RAY: Now, all of the changes I
11 note to the members are listed in the -- I guess they
12 are in the status report or --

13 MR. WANG: The status reports just have
14 all the standards.

15 CHAIRMAN RAY: Yes.

16 MR. WANG: All the detail of these
17 questions are being SER.

18 CHAIRMAN RAY: But by name, they are
19 listed in the status report, yes.

20 MR. ANDERSON: Mr. Chairman, we're
21 continuing on slide 13 of the slide packet that was
22 previously handed out. I'm Brian Anderson, Project
23 Manager in New Reactor Licensing. I've got some of
24 the technical staff, who have done a good job of
25 plotting this table up here, some of the technical

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1 staff that were involved in the review of this design
2 change. We're going to start in talking with the
3 vacuum relief system and then talk about changes to
4 the thermal cooling water system after that.

5 To my left is Michelle Hayes. She is a
6 technical reviewer in the Containment Systems Branch.

7 To my right are Anne-Marie Grady, Jack Zhao, and Jim
8 Strnisha. Anne-Marie is a technical reviewer in the
9 Containment Systems Branch. Jack is a technical
10 reviewer in the Instrumentation and Controls Branch.
11 And Jim is a technical reviewer in the Component
12 Integrity Performance and Testing Branch. We also
13 have other reviewers in the audience available if
14 questions come up.

15 CHAIRMAN RAY: Do we have a good acronym
16 for that last branch?

17 MR. ANDERSON: CIB is the acronym. I was
18 looking at it but trying to remember what it actually
19 stood for. I think the next slide was already covered
20 in the Westinghouse presentation, the proposed changes
21 to add a vacuum relief system. They result in a
22 reduction of the containment external pressure design
23 limit and also add a new technical specification:
24 3.6.10.

25 This one is very familiar. It was also

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1 used in the Westinghouse presentation. I won't talk
2 too much to it, but, as was previously stated, use of
3 an existing system line penetration for the
4 containment air filtration system is utilized to
5 motor-operated butterfly valves in parallel lines
6 outside of reactor containment and two check valves
7 located in parallel lines inside the containment.

8 MEMBER BROWN: The sheet that he gave us
9 last time said the external pressures is determined to
10 be -1.7. You said 1.7 is the -- did I misunderstand
11 the sign?

12 MR. BROCKHOFF: Psid. And I have -1 psid.

13 MEMBER BROWN: Oh, I'm sorry. That says
14 psig. Thank you.

15 MR. BROCKHOFF: Chuck Brockhoff,
16 Westinghouse.

17 CHAIRMAN RAY: Okay. Thanks.

18 By the way, could you tell us, just
19 roughly, where do we have vacuum breakers installed
20 now?

21 PARTICIPANT: Operating.

22 CHAIRMAN RAY: The operating plants, yes.

23 MS. GRADY: Waterford for one.

24 CHAIRMAN RAY: Waterford?

25 MS. GRADY: Yes.

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1 CHAIRMAN RAY: Okay.

2 MS. GRADY: And there are others because I
3 looked.

4 MEMBER BROWN: Chuck mentioned some, I
5 think.

6 MR. BROCKHOFF: Chuck Brockhoff,
7 Westinghouse.

8 Prairie Island and St. Lucie, sir, both
9 units at both sites.

10 CHAIRMAN RAY: All right. And does that
11 exhaust the list, Chuck?

12 MR. BROCKHOFF: I only checked for the
13 ones that were Westinghouse-related, sir.

14 CHAIRMAN RAY: Okay. Well, basically
15 because I am not that familiar with all the range of
16 plants that we have available, I just wondered how
17 common it was to have a vacuum breaker.

18 MR. BROCKHOFF: Plants with steel
19 containments is really the design, the containment
20 design.

21 CHAIRMAN RAY: But one would think of BWRs
22 in that context, Chuck.

23 MEMBER SHACK: BWRs have vacuum breakers.

24 CHAIRMAN RAY: Well, that's what I was
25 trying --

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1 MEMBER SHACK: Yes.

2 CHAIRMAN RAY: Do they all have them,
3 Bill? Well, this is not --

4 MEMBER SHACK: It would be like
5 Davis-Besse, which is a steel containment but isn't in
6 your survey.

7 MR. BROCKHOFF: Yes. Yes, sir. This is
8 Chuck Brockhoff with Westinghouse. Yes, sir, that's
9 correct.

10 CHAIRMAN RAY: Okay. So we're not looking
11 at something that is limited just to Waterford or
12 something?

13 MS. GRADY: No, it is not.

14 CHAIRMAN RAY: Okay. Yes. Go ahead,
15 please.

16 MR. ANDERSON: Slide 16 highlights the
17 categorization of the staff's review of the proposed
18 design changes. You saw on the Westinghouse slides,
19 in their presentation, that there were numerous DCD
20 sections that were affected by these proposed design
21 changes. So as part of the staff's review and as it's
22 structured in the safety evaluation report, these
23 proposed design changes included system design and
24 analyses, containment isolation leak rate testing,
25 design qualification and testing, instrumentation and

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1 control, and technical specifications. And those are
2 the different subsections that are listed and
3 described in the safety evaluation report.

4 MS. HAYES: Westinghouse provides that NRC
5 approved WGOthic model to incorporate the vacuum
6 relief system and to replace some of the extreme
7 conservatisms with more realistic but still bounding
8 assumptions regarding the temperature differential
9 across the shelf, the initial relative humidity in
10 containment, and the heat loads from a shutdown
11 reactor.

12 Westinghouse used the revised WGOthic
13 model to demonstrate the vacuum relief system is able
14 to maintain the containment pressure within the design
15 value of -1.7 psig. We go back and forth. Sometimes
16 we say -1.7. Sometimes we say external factor of 1.7
17 just to throw you off.

18 MEMBER BROWN: That's good.

19 MS. HAYES: During loss of a/c power event
20 on a cold day, which was the same limiting transient
21 they had in rev. 15, Westinghouse then ran sensitivity
22 studies for other scenarios to demonstrate that this
23 case was still the bounding scenario.

24 The staff reviewed the analysis
25 assumptions, including the basis for removing

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1 unnecessary conservatisms, and agreed they were
2 justified. The staff audited before calculation notes
3 supporting the analysis and found the assumptions were
4 conservative and the temperatures correctly
5 incorporated into the WGOthic model. The staff also
6 ran confirmatory analysis with the contain model. The
7 results were consistent with the Westinghouse
8 evaluation.

9 Next slide. The staff concluded that the
10 analysis was compliant with GDC 16 because it conforms
11 to the acceptance criteria.

12 DR. WALLIS: What is the most severe
13 transient? What is the most severe transient?

14 MS. HAYES: Loss of power on a cold day.

15 DR. WALLIS: How cold is the cold day?

16 MS. HAYES: The cold day starts at 25 and
17 drops 30 degrees an hour until it hits --

18 DR. WALLIS: What happens to the
19 barometric pressure?

20 MS. HAYES: -- 40.

21 DR. WALLIS: What happens to the
22 barometric pressure? Does that change, too?

23 MS. HAYES: No. That maintains the same
24 barometric pressure.

25 DR. WALLIS: Barometric pressure can

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1 change from 29 to 30. That's psi. And that's
2 significant in the 1.7 psi. So it seems to me they
3 should consider not just temperature but also the
4 barometric pressure temperature. Can they do that?

5 MS. HAYES: I know the barometric they're
6 not considering.

7 DR. WALLIS: No. It could be just as
8 important to --

9 MS. HAYES: I'm thinking about --

10 DR. WALLIS: No. It could be just as
11 important as the temperature change.

12 MS. HAYES: I understand. And I know that
13 there are some RAIs on that.

14 DR. WALLIS: Are there some RAIs on that?

15 MS. HAYES: I'm thinking about what the
16 response was.

17 DR. WALLIS: I was surprised they only
18 mentioned temperature because barometric pressure can
19 change.

20 MS. HAYES: Right. I mean, this resulted
21 from a question saying, "What if there is a storm
22 front coming and there are changes in the atmosphere?"

23 And I'm going to have to get back to you. I don't
24 recall right now.

25 CHAIRMAN RAY: That's all right. We can

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1 get your response later as you don't recall.

2 MS. HAYES: Okay.

3 DR. WALLIS: So what is the most severe
4 transient that was analyzed or is it still being
5 questioned whether it was the most severe?

6 MS. HAYES: Oh, I'm comfortable with the
7 most severe transient that was analyzed.

8 DR. WALLIS: Most severe? Okay.

9 MS. HAYES: Yes. Yes.

10 MS. GRADY: I reviewed the containment
11 isolation and leak rate testing aspects of the change
12 since these valves are now containment isolation
13 valves.

14 A vacuum relief design has two flow paths,
15 which connect directly with the containment atmosphere
16 and penetrate the primary containment. This design
17 complies with the requirements of GDC 56 by providing
18 each vacuum relief device with a check valve inside
19 containment and a motor-operated butterfly valve
20 outside containment.

21 This design complies with 10 CFR
22 50.34f(2)(14)(b) redundancy requirement. If a check
23 valve failed to close during an accident, the MOV and
24 series with it would close on the "T" signal providing
25 containment isolation.

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1 On the basis of the review of containment
2 isolation design of the closed vacuum relief design,
3 the staff concludes if the design complies with the
4 acceptance criteria of 624 of the SRP, including 10
5 CFR 50.34f(2)(14) additional TMI requirements --

6 DR. WALLIS: All these check valves are
7 outside containment atmospheric temperature? I mean,
8 I don't know if the butterfly valves are outside
9 containment.

10 CHAIRMAN RAY: Check valves are inside.

11 MS. GRADY: The check valves are inside.

12 DR. WALLIS: I mean, the butterfly valves
13 are outside at atmospheric conditions. And it's a
14 cold day.

15 MS. GRADY: No. They're --

16 DR. WALLIS: Yes. They're outside.

17 MS. GRADY: They're at atmospheric
18 conditions, but they're not -- and they're outside
19 containment. That's right.

20 DR. WALLIS: What if you have freezing
21 rain?

22 MS. GRADY: They're not out --

23 DR. WALLIS: Does it clog up these
24 butterfly valves?

25 MS. GRADY: They're not outdoors.

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1 DR. WALLIS: They're not outdoors?

2 MS. GRADY: They're outside the
3 containment.

4 DR. WALLIS: But they're --

5 MS. GRADY: They're in a --

6 DR. WALLIS: -- protected from the
7 weather. So you don't --

8 MS. GRADY: They're protected from the
9 weather.

10 DR. WALLIS: -- get moisture in there
11 which can freeze up --

12 MS. GRADY: I'm hesitating --

13 DR. WALLIS: -- on a very cold day here?

14 MS. GRADY: I'm hesitating because I can't
15 identify for you at this moment the room they're found
16 in, but they are --

17 DR. WALLIS: But they are protected
18 against freezing problems, moisture freezing in them?

19 MS. GRADY: Yes, they are.

20 DR. WALLIS: This could be a problem.

21 MS. GRADY: Yes, they are.

22 DR. WALLIS: They are?

23 MS. GRADY: Yes.

24 DR. WALLIS: And you're satisfied that's
25 good enough?

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1 MS. GRADY: Yes.

2 DR. WALLIS: Good.

3 CHAIRMAN RAY: Okay. It's all right.
4 Continue. That's a good answer. That's fine. Just
5 say "Yes" if it's yes and go on.

6 DR. WALLIS: How did you get satisfied
7 that it's good enough?

8 MS. GRADY: They're inside.

9 DR. WALLIS: Inside?

10 MS. GRADY: Yes. They're in an equipment
11 room, which --

12 DR. WALLIS: Which is kept above freezing?

13 MS. GRADY: Certainly.

14 DR. WALLIS: Thank you. So the air that's
15 coming in is very cold, isn't it? The air that goes
16 through is very cold? They're bringing in -4 degrees
17 air.

18 MS. GRADY: Yes.

19 MR. McKIRGAN: Mr. Chairman, John McKirgan
20 again for the staff.

21 Anne-Marie, correct me if I am wrong, but
22 these valves would also be subject to equipment
23 qualification requirements.

24 MS. GRADY: Absolutely.

25 MR. McKIRGAN: And that would include the

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1 environmental conditions?

2 MS. GRADY: Yes.

3 DR. WALLIS: That would include all the
4 environmental conditions?

5 MS. GRADY: Absolutely.

6 DR. WALLIS: And that will cover what I am
7 talking about?

8 MS. GRADY: Yes. These containment
9 isolation valves also meet the requirements that apply
10 to them based on the Containment Systems Branch
11 technical position 6-4, which has guidance for
12 containment purging during normal plant operation or
13 other valves that fall into that category.

14 On the basis of the review, the staff
15 concludes the proposed addition of the vacuum relief
16 valves to the already certified AP1000 containment
17 leakage rate testing program complies with the
18 acceptance criteria of 6-26 of the SRP.

19 CHAIRMAN RAY: All right.

20 MR. STRNISHA: Valve design qualification
21 at IST testing. It just adds two motor-operated
22 butterfly valves and two vacuum relief check valves
23 for the designs. The designs of both valves meet the
24 ASME boiler pressure vessel code section 3.

25 The butterfly valves are six-inch with

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1 offset discs, motor-operated from separate class 1E
2 battery sources and capacity coefficient and stroke
3 time for full flow capacity. The check valves are
4 six-inch horizontally installed swing check valves
5 with soft seats, open at a preset differential air
6 pressure of .2 psid for vacuum relief function. The
7 valve has a mechanical exerciser with a balancing
8 device for the set pressure. And it's low
9 capacity-tested.

10 For qualification, the butterfly valves
11 and the check valves are qualified in accordance with
12 QME-1-2007. The check valves, which also function as
13 vacuum relief valves, will satisfy ASME code NC7000
14 for over-pressure protection.

15 NRC audited the valve design specs at
16 Westinghouse in September and October and found them
17 to be acceptable in-service testing.

18 For the butterfly valves, in-service
19 testing will include remote position indication and
20 exercise every two years containment isolation leak
21 tests, exercise full stroke quarterly, and an MOV
22 operability test.

23 IST for the check valves will include
24 containment isolation leak tests, exercise full stroke
25 in both directions every refueling shutdown, and a

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1 vacuum relief test every two years in accordance with
2 the O&M Code appendix 1.

3 And for ITAC, the DCD tier 1, section
4 2.2.1 containment system table was revised to include
5 the butterfly valves and the check valves. And there
6 is an existing ITAC for components in this table for
7 design and construction.

8 Table 2.2.1.3 for the containment system
9 ITAC will be revised to specify the butterfly valve
10 closing time. And table 2.7.6.2 ITAC for the
11 ventilation system will be revised to include the
12 opening time for the butterfly valve.

13 And the conclusions are design and
14 qualification for the butterfly and check valves will
15 meet the boiler pressure vessel code in QME 1, the IST
16 activities will meet 10 CFR 50.55a and the O&M code.
17 And, based on the review, staff finds the design
18 qualification and testing of the valves to be
19 acceptable.

20 CHAIRMAN RAY: Any questions?

21 (No response.)

22 CHAIRMAN RAY: Thank you.

23 We'll do CCS now.

24 MR. ANDERSON: We still have a couple of
25 more slides for vacuum relief.

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1 CHAIRMAN RAY: Oh, we do? Okay. Sorry.

2 MEMBER BROWN: Can I ask an educational
3 question? What is the critical weakness that dictates
4 the differential pressure the containment is good for?

5 CHAIRMAN RAY: The big --

6 MEMBER BROWN: No. I understand that, but
7 what is -- I mean, I'm just relating back. I've got
8 submarines that go down --

9 (Laughter.)

10 CHAIRMAN RAY: It's over-stressing the
11 pressure vessel due to external pressure.

12 MEMBER BLEY: It's built for inside-out
13 pressure. It's not built to take outside in.

14 CHAIRMAN RAY: Unlike a submarine.

15 MEMBER BROWN: Well, they'll handle a fair
16 amount the other way also.

17 MEMBER BLEY: Think of a boot camp.

18 MEMBER BROWN: No. I understand. So it's
19 strictly the external questioning at inwards? It's
20 not as sturdy as it is --

21 CHAIRMAN RAY: "Crushing" isn't quite the
22 right word, but --

23 MEMBER BROWN: Okay. Buckling. All
24 right. Thank you very much.

25 MEMBER SHACK: It won't deform

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1 plastically.

2 MEMBER BROWN: So internally you're saying
3 we can pressurize it pretty well, but externally it
4 can't handle the same strokes.

5 MEMBER BLEY: Your boat has some strength
6 numbers in there, too.

7 CHAIRMAN RAY: Let's go ahead and finish
8 up this section here.

9 MEMBER BROWN: That's fine. You answered
10 my question. Thank you.

11 MR. ZHAO: I'm Jack Zhao in the I&C
12 Branch. I would like to present the evaluation and
13 the I&C changes related to this as a new vacuum break
14 system.

15 Applicant proposed to include a new and
16 functioning control in the PMS for the two new vacuum
17 break walls. And the Westinghouse also included the
18 manual control. And the wall was a status indication
19 in the control room.

20 There are no changes to the AP1000 I&C
21 architectures.

22 MEMBER BROWN: Yes. I guess maybe
23 Westinghouse can, maybe you can answer this. Does
24 this mean a new control module in terms of application
25 code or is this going to be integrated into the

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1 existing application for ESF functions? Is my
2 question clear or not clear? Oh, there you are.

3 MR. BROCKHOFF: Chuck Brockhoff,
4 Westinghouse.

5 We will put another channel in that will
6 be a sensor from the containment pressure. And it
7 will take that output of that channel and use it to
8 close these. So it's basically a logic circuit.

9 MEMBER BROWN: I understand you've got to
10 have a sensor, but it's going to the same -- how many
11 divisions?

12 MR. BROCKHOFF: Four divisions.

13 MEMBER BROWN: Four divisions?

14 MR. BROCKHOFF: Yes, sir.

15 MEMBER BROWN: So you're going to go into
16 the same chain for each division?

17 MR. BROCKHOFF: Yes, sir.

18 MEMBER BROWN: So the application code
19 will have to be upgraded to handle this kind of -- you
20 have to have software in order to do this? So it's
21 more processing time.

22 MR. BROCKHOFF: It will take additional
23 channels to process the logic for that. Yes, sir.

24 MEMBER BROWN: It's not channels. They're
25 all still in the same division. So it's not more

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1 channels. It's more software.

2 MR. BROCKHOFF: Yes, sir.

3 MEMBER BROWN: So you're going to eat up
4 more processing time.

5 MR. ZHAO: Not too many, just --

6 MEMBER BROWN: I understand that. It
7 would be easier to run the test. I got that. It's
8 just an example, just an example. It would be easier
9 to run the test that I would like to see. So now you
10 will have more stuff. You will want to take out --

11 MEMBER ARMIJO: You want to add more stuff
12 in there.

13 MR. ZHAO: Yes, a few more inputs, a few
14 more outputs.

15 MEMBER BROWN: Okay. I just want to make
16 sure it will be a separate setup and you were going to
17 go through the existing PMS system, how it was going
18 to be done. You have answered the question. Thank
19 you.

20 MR. ZHAO: Okay. So after the staff
21 concludes, then, the proposed I&C changes comply with
22 the requirements in the GDC 13, 19, 20, and 21.

23 Next, please. For the changes to the tech
24 spec, applicants include in the low tier the
25 containment pressure trip function to the tech spec

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1 table, 3.3.2-1, for the vacuum break valves.
2 Applicant also included the tech spec in your tech
3 specs for the control of the vacuum breaker valves.

4 MEMBER BROWN: Let me back up and ask
5 another question. This is an SFAS system? Is this
6 considered a safeguards?

7 MR. ZHAO: Yes.

8 MEMBER BROWN: Not a reactor trip
9 obviously?

10 MR. ZHAO: Yes.

11 MEMBER BROWN: So that means this now
12 falls under the two out of two?

13 MR. ZHAO: No. That is not under DAS.
14 This is two out of four.

15 MEMBER BROWN: Oh, okay. All right.

16 MR. ZHAO: Yes.

17 MEMBER BROWN: Oh, that's DAS. Okay.
18 Excuse me.

19 MR. ZHAO: Yes. That's DAS.

20 MEMBER BROWN: Thank you. I'm sorry. I'm
21 just --

22 MR. ZHAO: Westinghouse revised the tech
23 spec 3.6.4 and tech spec 3.6.5 to new tech spec
24 3.6.10. On the basis of the review, the staff
25 concludes the tech spec is accurately addressed.

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1 CHAIRMAN RAY: Okay.

2 MR. ZHAO: That concludes my presentation.

3 CHAIRMAN RAY: Thank you.

4 MR. ANDERSON: That concludes the staff's
5 presentation for vacuum relief. We would like to
6 change a couple of people up front before starting the
7 --

8 MEMBER BROWN: Since you brought up DAS
9 and I got it wrong, is this function going to be
10 incorporated into the DAS also?

11 MR. ZHAO: No.

12 MEMBER BROWN: So there's no driving force
13 that needs to be --

14 MR. ZHAO: This is no change to the DAS.

15 MEMBER BROWN: Okay. No change. Thank
16 you.

17 MR. ZHAO: Because it will change it.
18 Yes.

19 CHAIRMAN RAY: Okay.

20 MR. ANDERSON: And joining me at the table
21 is Larry Wheeler. Larry is a technical reviewer in
22 the Balance of Plant Branch. Jack Zhao and Anne-Marie
23 Grady are still seated here with me.

24 This introduction slide highlights a lot
25 of what Westinghouse spoke of earlier. Design changes

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1 for the component cooling water system include
2 modifications to the system piping, changes to the
3 closure logic for containment isolation valve,
4 including the addition of tech specs functions and
5 also modifies the reactor coolant pump heat exchanger
6 outlet isolation valve closure module.

7 MR. WHEELER: Next slide. Modifications
8 to the CCS pipe, the additions of two four-by-six-inch
9 ASIV safety class relief valves on the ten-inch or
10 component cooling supply return lines just inside the
11 innermost containment isolation valves, the change to
12 the piping, safety class, between the innermost
13 containment isolation valves and the appendix J test
14 valves from non-safety, non-seismic to ASME section 3,
15 class 3 to ensure that the relief valves are installed
16 as ASME safety class piping.

17 MR. ZHAO: Okay. Again next I will talk
18 about the I&C changes and the evaluation of the I&C
19 changes. Basically you mentioned this to the I&C
20 system. The first one is the modification to the
21 closure logic for the containment isolation valves.

22 The modification includes additional
23 closing logic and the generation of the RCP bearing
24 water high temperature. This, you know, the RCP
25 bearing water high temperature, is also included in

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1 the tech spec table, 3.3.2-1.

2 This additional corrosion logic is derived
3 from two out of the four logic of the high RCP bearing
4 water temperature in those RCP. This additional
5 corrosion logic is implemented in the safety-related
6 PMAs.

7 Next, please. The second mentioned is the
8 modification to the RCP heat exchanger outlet
9 isolation valves. The applicant removed automatic
10 closing logic for this outlet isolation valve. Also,
11 the manual control from the main control room is
12 returned for outside in the isolation valves.

13 These are high delta and flow inlet and
14 outlet flows, which will generate a deviation alarm.
15 This alarm indicates in RCS leaking conditions. So as
16 operators, operators could close in outside isolation
17 valves for each RCP.

18 There's flow and the outside isolation
19 valves are non-safety-related. So, again, there is no
20 modification to the AP1000 I&C architecture.

21 So that's all the I&C changes.

22 MS. GRADY: As far as the changes to the
23 containment isolation valves, the CCS piping is
24 adequately protected from over-pressurization due to a
25 postulated electrical and pump external heat exchanger

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1 tube rupture.

2 There are two, ASME three, class 3 relief
3 valves: one on the inlet, one on the outlet of the
4 cooling water. Both relief valves would see the
5 over-pressurization event. And the relief valves
6 limit the CCS pressure to approximately 200 psig,
7 which is the set pressure of the relief valve.

8 Containment isolation valves close on
9 sensed RCP high bearing water temperature. The staff
10 did a confirmatory RELAP analysis. Westinghouse did a
11 RELAP analysis aided with a consultant. And we did a
12 confirmatory RELAP analysis on the isolation valve
13 closure time to make sure that the piping
14 classification between the containment isolation
15 valves would be protected and within the piping
16 classification of 300 degrees F., 230 psig, which are
17 the piping classes. Containment isolation valve
18 closure occurs within a few minutes with RCS in the
19 area of 200 degrees F.

20 During a postulated reactor coolant pump
21 heat exchanger tube rupture, the proposed design
22 change meets all the applicable NRC regulations. It
23 does not adversely affect safety-related systems,
24 structures, and components. It will still perform
25 defense-in-depth and RTNSS functions.

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1 Tech specs are adequately addressed. The
2 change provides a new containment isolation signal to
3 the already existing component cooling water isolation
4 valves.

5 The over-pressure protection maintains
6 containment integrity. And it prevents an
7 intra-system LOCA.

8 DR. WALLIS: RCS means containment, not
9 cooling systems?

10 MS. GRADY: I'm sorry?

11 DR. WALLIS: When you say, "RCS," do you
12 mean containment or do you mean cooling or what does
13 RCS mean to you?

14 CHAIRMAN RAY: Reactor cooling system.

15 MS. GRADY: Reactor cooling system.

16 DR. WALLIS: It goes to 200 degrees F.?

17 MS. GRADY: No. CCS. Did I misspeak?

18 DR. WALLIS: There's RCS at 200 degrees F.
19 I wonder how RCS gets to 200 degrees F.

20 MS. GRADY: It's CCS. Sorry.

21 DR. WALLIS: CCS. Okay.

22 MR. CHAPMAN: This is Travis Chapman from
23 the Technical Specifications Group.

24 Anne-Marie, actually, that is correct.
25 One of the issues that came up when we reviewed this

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1 was whether with Westinghouse, whether this was
2 applicable in modes 1 and 2 only or modes 1 through 4.

3 An issue with -- if you are mode 3 or 4, you may be
4 at a lower temperature but still be high pressure. So
5 if you had that postulated to break, you could still
6 have an inner system LOCA potentially. The
7 temperature would be lower, but the coolant would
8 still be going out of the RCS into the CCS.

9 So the issue that we wanted to address was
10 at lower temperature RCS cooling in the heat exchanger
11 near 200 degrees, would you still get the isolation
12 signal in time to isolate the CCS components, isolate
13 the rest of the system. And they also proved that it
14 does work.

15 DR. WALLIS: So this should be RCS, which
16 is actually in the coolant system in the heat
17 exchanger.

18 MR. CHAPMAN: In modes 3 or 4, the RCS
19 that is in the pump might be at a cooler temperature
20 --

21 DR. WALLIS: Okay. I just didn't --

22 MR. CHAPMAN: -- but still higher
23 temperature.

24 DR. WALLIS: -- know it was in those
25 modes. Okay. Thanks. Thanks.

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1 MR. ANDERSON: And that concludes the
2 staff's presentation for these --

3 MR. McKIRGAN: Mr. Chairman? Pardon. Mr.
4 Chairman, in the spirit of not trying to create new
5 open items, I wondered if the staff could come back
6 and potentially address Dr. Wallis' question about the
7 pressure change during the transient with the vacuum
8 relief.

9 CHAIRMAN RAY: Oh, yes. The barometric
10 pressure?

11 MR. McKIRGAN: Yes.

12 CHAIRMAN RAY: Yes, of course.

13 MR. McKIRGAN: Perhaps I might ask Ms.
14 Hayes to step back up? I think we want to make sure
15 we understand Dr. Wallis' question.

16 DR. WALLIS: Would you read my question
17 back to me?

18 (Laughter.)

19 CHAIRMAN RAY: The question was, have they
20 considered as a worst case a change in the barometric
21 pressure?

22 DR. WALLIS: It was the change in
23 barometric temperature, if both of them --

24 CHAIRMAN RAY: Yes.

25 MS. HAYES: Right. And I believe that's

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1 inherently considered because the valve goes off at a
2 delta P. It doesn't matter.

3 DR. WALLIS: No. The load on the
4 containment, the actual -- the problem to be solved is
5 that the pressure on the containment goes down. And
6 it goes down for two reasons. It's cooled. And it
7 goes down relative to the atmosphere. If the
8 atmosphere goes up, then the pressure.

9 So you've got two things. You've got the
10 barometric pressure change and the temperature change.

11 MS. HAYES: So the barometric --

12 DR. WALLIS: The only thing Westinghouse
13 mentioned was the temperature change.

14 MS. HAYES: Right. That's what they
15 considered, but the --

16 DR. WALLIS: No. It's Wisconsin and the
17 other --

18 CHAIRMAN RAY: Wait, wait, wait. Let her
19 finish what she wanted to say.

20 DR. WALLIS: Okay.

21 MS. HAYES: The valve actuates on a delta
22 P set point. It's a --

23 DR. WALLIS: Yes, but it's capacity. The
24 capacity of the system has to do with the worst case,
25 right? You said the worst case was --

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1 MS. HAYES: Delta P.

2 DR. WALLIS: Worst case to me is one where
3 you've got this sudden chilling, which drops the
4 pressure inside the containment simultaneous with a
5 high barometric pressure outside, which often goes
6 with very cold --

7 CHAIRMAN RAY: He's not talking about the
8 actuation. He's talking about the capacity. So
9 you've got two things that need to be adjusted. One
10 is an increase in barometric pressure, and the other
11 is a simultaneous decline in internal pressure.

12 DR. WALLIS: Are the pipes big enough to
13 take that situation?

14 CHAIRMAN RAY: I'm trying to --

15 DR. WALLIS: Okay.

16 CHAIRMAN RAY: -- restate it is all I'm
17 trying --

18 DR. WALLIS: I wondered if it was
19 understood. I thought you understood what I said.

20 MS. HAYES: Apparently I didn't.

21 CHAIRMAN RAY: Wait a minute. Okay. So
22 you size it because of the reduction in internal
23 pressure due to temperature change. Do we have that?

24 MR. McKIRGAN: Yes.

25 CHAIRMAN RAY: We're not even sure if we

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1 have that. Okay.

2 MS. HAYES: I personally didn't size it,
3 but I reviewed the analysis and --

4 CHAIRMAN RAY: All right. Let me not
5 direct the question to you. Let me just direct it to
6 the room. The concern is that there are two things
7 that can cause a differential pressure. And the
8 question is, is the sizing sufficient to deal with a
9 simultaneous existence of both of them?

10 It's not a question of actuating the
11 system. It's a question of the sizing of the line.
12 That's --

13 MS. HAYES: I still want to say yes.

14 CHAIRMAN RAY: Okay. That's fine. That's
15 all right. So we don't know the answer, and that's
16 enough.

17 DR. WALLIS: You reviewed it. And you
18 said the worst condition was satisfied or something.

19 CHAIRMAN RAY: I know. But now we
20 understand that it doesn't include a simultaneous
21 change in barometric pressure I gather.

22 DR. WALLIS: Have you asked Westinghouse
23 if they have that?

24 CHAIRMAN RAY: In due course. Okay.

25 Anything else you want?

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1 MR. MCKIRGAN: No. Thank you, Mr.
2 Chairman.

3 CHAIRMAN RAY: All right. That's it,
4 Brian?

5 MR. ANDERSON: That is it.

6 CHAIRMAN RAY: All right. Would you stay
7 there for just a second? Let me see if I can get the
8 -- it's 20 minutes to 3:00. We're going to take a
9 break. And then we're going to talk about trying to
10 get closure by the end of the full Committee meeting
11 in December.

12 But before we do that, is there anything
13 else you want to present, Eileen?

14 MS. MCKENNA: No. We really just left
15 time in case there were questions by the --

16 CHAIRMAN RAY: There will be questions for
17 sure.

18 MS. MCKENNA: I meant on the other chapter
19 23 changes.

20 CHAIRMAN RAY: Oh, okay.

21 MS. MCKENNA: But if there are specific
22 questions in that time period --

23 CHAIRMAN RAY: All right. That's what I
24 am going to address myself to right now.

25 MS. MCKENNA: -- whatever else you want to

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1 use it for.

2 CHAIRMAN RAY: And so I want to -- because
3 I know how busy the members are, I am going to just
4 recite what the other changes are or all of the
5 changes, including those that we have heard. And I'll
6 make some comments on a couple of them to see if they
7 trigger anything.

8 Anyway, they're listed in material that
9 you have. They involve the component cooling water
10 system changes -- we've heard about those -- changes
11 to the ancillary diesel generator system; changes to
12 potable water system; changes to reactor coolant
13 pressure boundary leakage detection; changes to spent
14 fuel pool flood-up valve remote position indication;
15 changes to AP1000 steam generator thermal hydraulic
16 data report; changes related to the implementation of
17 P17 for rod withdrawal prohibit; changes related to
18 post-design basis accident transmitters; changes to
19 start-up feedwater system and chemical environ.
20 control system logic; changes to passive core cooling
21 system injection lines -- now, there is a phrase that
22 we have touched on earlier today, isn't it? -- changes
23 to squid valve actuation time; changes related to
24 anticipatory reactor trip in the event of an
25 inadvertent passive residual heat removal actuation --

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1 that's an interesting one -- changes to reactor and
2 turbine trips from logic of diverse actuation system;
3 changes to steam generator instrument piping; changes
4 to the steel containment vessel girder and puller
5 crane rail clip; changes to reactor vessel support
6 system -- we heard some about that -- changes to the
7 main control room emergency habitability system;
8 changes to the main steam isolation valve
9 subcompartment; changes to the component cooling water
10 system, in addition to the ones we talked about; and
11 changes to add a vacuum relief system containment,
12 which we just talked about.

13 Now, I went over those quickly, but I
14 wanted to make sure that the Subcommittee knew all of
15 the changes and I wanted to note that they deal with
16 quite a number of things, including the passive core
17 cooling system injection lines.

18 What is that about, Ed?

19 MR. CUMMINS: Excuse me?

20 CHAIRMAN RAY: What are the changes to the
21 passive core cooling system injection lines about?

22 MR. CUMMINS: I think we talked about this
23 in another meeting --

24 CHAIRMAN RAY: Okay.

25 MR. CUMMINS: -- related to the gas

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1 entrainment. We have the accumulator line injecting
2 into the DVI line below the connection of the IRWST.
3 And it was, at least theoretically, possible that the
4 line from the high point from the IRWST injection
5 could fill with gas.

6 And then there would be some additional
7 head required in the pressurization before injection
8 would occur. And so we changed the location of where
9 the accumulator injects to a higher point on the DVI
10 line so that it would not possibly fill the injection
11 line from the IRWST with gas.

12 CHAIRMAN RAY: Thank you. That is
13 well-stated.

14 And, lastly, what are the changes to the
15 passive containment cooling system? This is 23S.

16 MS. McKENNA: That's the one that we've
17 discussed: the air vents and the spent --

18 CHAIRMAN RAY: We're talking about the air
19 vents there?

20 MS. McKENNA: Yes, yes.

21 CHAIRMAN RAY: Okay. All right. Well, I
22 was wanting to be sure that it wasn't something other
23 or different from the air vents, but if it's the air
24 vents we're talking about, that's fine. Okay. Thank
25 you.

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1 All right. We're going to take a break.
2 And then we'll finish the day. And I hope I can keep
3 everybody engaged because this is our last chance to
4 define a pathway to closure here.

5 MR. CUMMINS: Mr. Chairman?

6 CHAIRMAN RAY: Yes?

7 MR. CUMMINS: With that in mind, we have
8 responses to a couple of questions that Dr. Banerjee
9 had with regard to the paper and the fiber. If we
10 could have a few minutes after the break, I think we
11 might be able to address those issues as well.

12 CHAIRMAN RAY: Well, I'm sure Sanjoy would
13 appreciate that. But I will then ask everybody to be
14 back promptly, please, at not later than 3:00 o'clock.

15 (Whereupon, the foregoing matter went off
16 the record at 2:45 p.m. and went back on the record at
17 3:00 p.m.)

18 CHAIRMAN RAY: It's 3:00 o'clock on Friday
19 afternoon before Thanksgiving week. So let's all
20 focus here. Mr. Schulz is going to try again.

21 MR. SCHULZ: Third time's the charm.

22 CHAIRMAN RAY: So you have our attention,
23 including that of Dr. Banerjee.

24 MR. SCHULZ: Okay. Thank you.

25 Cesare Frepoli is on the phone. And I

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1 think he has -- we relayed to him Dr. Banerjee's
2 questions or concerns. Cesare, could you please speak
3 to those concerns?

4 MR. FREPOLI: Yes. This is Cesare
5 Frepoli, Westinghouse.

6 If I understood correctly the question
7 that Dr. Banerjee was referring to, figure 6 of the
8 paper, which shows trends of the correlation with the
9 flow, together with the correlation, I kind of went
10 back to look at the number.

11 And basically where we are in the business
12 venue, the most severe case, which is the new 2, where
13 we have 41 pounds a second --

14 MEMBER BANERJEE: Cesare, can I just make
15 sure that you understood, the question was conveyed to
16 you so that you understood the concern? Yes, it is
17 related to figure 6 and those 2 equations, 13 and 14,
18 but the concern was as follows, that the dotted line
19 which is the prediction of the CHF at the lower mass
20 flows did not change very much.

21 And what that sort of triggered in us is
22 the whole sort of issue, then, as to whether you could
23 use at all a correlation something like the one in 13
24 and 14 because it just doesn't make too much physical
25 sense. And that is where we are.

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1 So we are even asking whether you can
2 apply something like Chang in this case if it doesn't
3 show any effect. If it doesn't show any effect, then
4 I think it flies somewhat in the face of physical
5 reality.

6 MR. FREPOLI: Okay.

7 MEMBER BANERJEE: So that is a much wider
8 question, actually.

9 MR. FREPOLI: I understand better now. My
10 understanding was that the correlation was constructed
11 in two terms, where basically the first term, which is
12 dependent on the flow, is essentially showing the
13 intersection in those with G close to zero.

14 MEMBER BANERJEE: Right.

15 MR. FREPOLI: I did confirm that where we
16 are with the 41 pounds a second to respond is to about
17 five kilograms a square meter per second. And that
18 translates in a QC check far. Then if you convert
19 that back to a QC check, that for the costs on terms,
20 the one independent on the flow rate is 17 kilograms a
21 square meter.

22 And the heat, the maximum heat, flux we
23 have in the core at that time is 14 kilograms a square
24 meter. So that's why we don't see much of a
25 dependency.

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1 But now if you are challenging the
2 applicability of the correlation, that may be a
3 different question.

4 MEMBER BANERJEE: Well, what is concerning
5 us I'll tell you is it started, of course, with the
6 fact that at a 41-pound mass per second, you are
7 getting virtually the same curve as you got at 60 or
8 something like that if you look back at case 10.

9 Now, if it is that close to the intercept,
10 you still have a g effect, even if it is close to the
11 intercept. But I didn't realize it was that close to
12 the intercept. So you're saying that it is only about
13 five -- it is five kilograms per meter squared second
14 based on the flow area?

15 MR. FREPOLI: Yes because you have a
16 41-pound a second. The core flow area is 41.5 feet a
17 second. That gives you one pound/feet square a
18 second. And then you convert in lesser units.

19 MEMBER BANERJEE: It's about five kilos
20 per, yes. Okay.

21 MR. FREPOLI: It's about five kilograms
22 per square meter second. So you really are down at
23 the -- these intersect. And so the first portion is
24 really the dominant factor. It's the one --

25 MEMBER BANERJEE: So the flooding -- okay.

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1 So I see where it is coming from now, why it is so
2 insensitive. But, still, even at that very low g , I
3 think we don't know the magnitude of the first term
4 and 13 compared to the second term. The second term
5 goes as $g^{1.45}$, right, in equation 15?

6 MR. FREPOLI: Yes. There is a high flow
7 and a low flow behavior.

8 MEMBER BANERJEE: Right.

9 MR. FREPOLI: The high flow was 1.6, and
10 the other was 0.75.

11 MEMBER BANERJEE: Well, the low flow is
12 1.45 in what I have. And the high flow is .77, the g
13 behavior. Now, those two terms, what we don't know,
14 of course, is $Q \cdot C^{SCCF}$, but --

15 MR. FREPOLI: $Q \cdot C$ chapter coming out from
16 my calculations is the first portion.

17 MEMBER BANERJEE: Right.

18 MR. FREPOLI: The $QCSHR$ is the same cost
19 for both. It's 0.019. Well, it doesn't have much
20 there because we need to know the other contribution.
21 And, unfortunately, I don't have my map up right now.

22 MEMBER BANERJEE: Right. So there are two
23 concerns here. One is, of course, the effect on g and
24 whether your codes and whether this is really
25 applicable because this is for sort of a tube. And

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1 the second is, how are you getting your L by D there
2 because this has an L by D ratio in there as well,
3 right?

4 MR. FREPOLI: Yes.

5 MEMBER BANERJEE: So, I mean, what is L by
6 D being defined? I mean, this is an experiment which
7 is done in annuli and tubes and being applied in this
8 situation. I don't think anybody has ever validated
9 these correlations at these low flows. At least I
10 don't know whether COBRA/TRAC has ever been validated
11 against these extremely low flows you are talking
12 about.

13 MR. FREPOLI: That is the reason that this
14 correlation -- first of all, this correlation is not
15 implemented in COBRA/TRAC, as mentioned yesterday. We
16 also went through kind of a screening on all of those
17 correlations that are applicable to low flow and low
18 pressure. This actually is the one that seems to be
19 the most penalizing as far as the dependency on the
20 flow as you approach the no-flow situation.

21 There were other correlations that we were
22 considering, like the -- I don't have the list in
23 front of me, but we explore two correlations that were
24 not as severe as the TRAC correlation.

25 MEMBER BANERJEE: Well, they say --

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1 MR. FREPOLI: To go back to your question
2 about the L over D, here is the L over D through the
3 heated line. So it becomes at this point the link to
4 get to the C checkpoint.

5 MEMBER BANERJEE: But usually L by D gives
6 you a boiling length or some sort of an effect like
7 that, but when you've got a non-uniform heat flux,
8 but, even leaving that aside, let's assume that this
9 is your heated length. Shouldn't you have more of a g
10 dependence if you look at the --

11 DR. WALLIS: Five is here.

12 MEMBER BANERJEE: Well, it's hard to know
13 because it's so close to the intersect, I guess.

14 MR. FREPOLI: Well, I think that you get
15 to the intersect essentially saying now you are in a
16 column of water where you have the chucking up and
17 down of the liquid and you are going to be going
18 through CHF if you exceed the CCF valve, essentially
19 the physics. That was my interpretation of this, the
20 first.

21 MEMBER BANERJEE: Yes, provided you are
22 throwing the water out, right? And then it's coming
23 back down? Well, let us think about this a little,
24 but I think it has been helpful to hear that the g was
25 that low, which is that we didn't know that, yes.

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1 MR. FREPOLI: Thank you. The g is five
2 kilograms per square meter second.

3 MEMBER BANERJEE: Yes. So that probably
4 is the reason why it's showing that insensitivity to
5 g. Okay.

6 Thank you, though. We can move off this
7 subject.

8 MR. SCHULZ: Thank you. Thank you,
9 Cesare.

10 6. CHAPTER 23 VACUUM AND CCS ITEMS

11 MR. SCHULZ: I have Dr. Banerjee expressed
12 a desire to have us list the experimental exponent in
13 this table. Well, we had provided this table this
14 morning, but we had not included the b exponent. And
15 it's now listed in the table.

16 So this is the exponent we used to
17 calculate the K over A squared. And now we have put
18 an asterisk beside that second K over A squared.

19 And the note below says that was
20 calculated using the test-based exponent b. So we'll
21 try to clarify that.

22 MEMBER BANERJEE: So you've got the
23 exponents now?

24 MR. SCHULZ: Yes.

25 MEMBER BANERJEE: That's all I needed.

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1 Yes.

2 CHAIRMAN RAY: Squeezed them in.

3 MR. SCHULZ: Yes, right.

4 MEMBER BANERJEE: It's nice to have them.

5 MR. SCHULZ: Okay. Now, yesterday we had
6 shown you some relationship we had developed base for
7 the DP as a function of the fiber. And so what I have
8 here are a few slides that will show you what we did.

9 And we've gotten permission to show you the test
10 data. These are the owner group test data. So it
11 takes a couple of steps here to get to the infamous
12 blue line.

13 So the first thing is looking at a set of
14 five tests that were run in the owners' group. They
15 were run at three gallons a minute constant flow rate.

16 The fiber was 18 grams, which is actually very close
17 to the 17.3 that we typically use. The chemicals were
18 similar to I think a little bit greater than AP1000
19 chemicals. And that's not terribly important because,
20 again, the initial chemicals are what give you the
21 biggest effect.

22 So you see here the blue dots, the blue
23 triangles, and then you see -- so that's the test
24 data. And then a curve was the best fit through those
25 test points.

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1 Now, this --

2 DR. WALLIS: What these test points are
3 showing is that if you have more particles, more
4 debris, you have less pressure drop.

5 MR. SCHULZ: In the extreme, yes.

6 DR. WALLIS: Which means that if you did
7 32 first, the 45, and then added 15 to get up to 33,
8 you wouldn't expect it to go down, the pressure drop
9 to go down.

10 Suppose you did a procedure where you did
11 number 32 first and then you put in the extra 15
12 particles, extra particles. You've already got a
13 pressure drop of 1.74. And then you put in the
14 particles to bring it up to 33. That's a different
15 procedure for 33.

16 MR. SCHULZ: Yes.

17 DR. WALLIS: You wouldn't expect it to
18 halve its pressure drop when you put in some more
19 particles, would you?

20 MR. SCHULZ: Probably not.

21 DR. WALLIS: So it means that it's very
22 dependent on the procedure.

23 MR. SCHULZ: And how the bed forms.

24 DR. WALLIS: Yes. Okay. So we have
25 established that?

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1 MR. SCHULZ: Yes.

2 MEMBER BANERJEE: What is the particle by

3 --

4 MR. CUMMINS: This is Ed Cummins.

5 I think that that is within the
6 variability of our results. I don't believe that you
7 can conclude anything about your procedure.

8 DR. WALLIS: Well, if it's within the
9 variability of the results, then you can't choose a
10 maximum through the number of points you have there.
11 You can't have it both ways.

12 I was going to draw attention to the next
13 slide, where the variability in the red is within the
14 -- you know, you've got that uncertainty of the blue
15 points. You can't find a maximum.

16 So it's nice what you're doing, but it's
17 within such a sparse data set and with so much
18 uncertainty in the data that it's hard to draw kind of
19 some of the conclusions you draw.

20 MEMBER BANERJEE: What is the particle --

21 MEMBER SHACK: It's a conservative
22 treatment of the data he's got. I'll grant them that.

23 MEMBER BANERJEE: What is the
24 particle-fiber ratio?

25 DR. WALLIS: Is it? Pardon me?

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1 MEMBER BANERJEE: What is the
2 particle-fiber ratio for AP1000 that's working?

3 MR. SCHULZ: The next slide shows that,
4 Dr. Banerjee, if I might. So basically we used this
5 slide to make a relationship and try to between
6 particle fiber ratio and DP through these points.

7 MEMBER ARMIJO: Before you leave that, all
8 of your data points but one show a monotonic increase
9 in DP. And you have this one data point that says
10 there's a maximum. How solid is that? You know if
11 you --

12 MR. SCHULZ: There is other data that the
13 owners' group ran a similar number of tests that we
14 did. And initially they were concentrating their
15 efforts on maximum debris in the plant, maximum
16 particles, maximum fiber, maximum chemicals.

17 And apparently the staff asked them, said,
18 "Well, AP1000 is getting higher pressure drops with
19 less particles. Would that happen to you?" So they
20 explored reducing the amount of particles and found
21 that it was larger. Then they did this. So this is
22 not the only data that they have.

23 MEMBER ARMIJO: Okay. So the fact that
24 there is a maximum somewhere is --

25 DR. WALLIS: But the maximum is dependent

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1 on the procedure. Their procedure is different from
2 yours. They put the particles in first, and then they
3 put in the other stuff.

4 MR. SCHULZ: Yes.

5 DR. WALLIS: You put them all in together.

6 MR. SCHULZ: Which is intended to make a
7 conservative debris bit.

8 DR. WALLIS: But theirs is also intended
9 to make a conservative debris bit. So you've got two
10 different definitions of what's a conservative --

11 MEMBER SHACK: They have two different
12 procedures that seem to give them the same result.
13 That is, there is, in fact, a maximum particle fiber
14 loading.

15 DR. WALLIS: But there must be a procedure
16 like mine, where you do two first and then at the
17 particles, where it is bound to follow the trend that
18 Sam was talking about.

19 MR. SCHULZ: I mean, that would be
20 interesting if that is a credible situation.

21 DR. WALLIS: So all of this is very
22 interesting. I think the bottom line is within the
23 scatter and all of the data, there is so much margin.

24 All this other stuff is just a little bit iffy.

25 MR. SCHULZ: Well, we are not claiming

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1 this is --

2 MEMBER BANERJEE: Why don't we let you go
3 through --

4 DR. WALLIS: Yes, let you go through.

5 MEMBER BANERJEE: -- your presentation?

6 MR. SCHULZ: Thank you.

7 So this next slide basically takes what we
8 did in the first slide and adds some AP1000 data
9 points. So these tests, 26, 27, and 28, are where we
10 investigated particle-fiber ratio. And basically we
11 had started with a higher ratio in test 26, which
12 represented the maximum amount of particles that are
13 available in AP1000 along with the maximum fiber.

14 And based on some inputs from the owners'
15 group data, we thought maybe less particles might be
16 more limiting. And, in fact, when we dropped from 31
17 to 28, the DP went up almost a factor of two.

18 Now, yes, there is a lot of variability in
19 AP1000 data, but the differences here are also fairly
20 large.

21 DR. WALLIS: I would say that those red
22 points show scatter. They don't show a maximum.

23 MR. SCHULZ: That's what you can say, yes.

24 DR. WALLIS: Yes.

25 MR. SCHULZ: We don't agree with that.

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1 DR. WALLIS: No. Well, I think you are on
2 very thin ice.

3 MR. SCHULZ: Well, okay.

4 MEMBER BANERJEE: Let's not argue it.

5 (Laughter.)

6 MEMBER BANERJEE: Let's move on.

7 MR. SCHULZ: So what we were really after
8 was trying to incorporate some owners' group data that
9 existed with significantly more fiber.

10 DR. WALLIS: That's very helpful.

11 MR. SCHULZ: So they have three data
12 points or three tests, which are on the sort of top
13 left-hand, test 21, 22, 23, which were done with 75
14 grams of fiber. So that is more than four times
15 AP1000 limits.

16 And now one of the challenges we had was
17 that the particle-fiber ratios were relatively low:
18 zero, 1, and 4.8. And you see those plotted in the
19 curve with the red squares.

20 There were also a couple of other tests --

21 DR. WALLIS: That is an amazing
22 extrapolation, isn't it?

23 MR. SCHULZ: It's also extremely
24 conservative.

25 DR. WALLIS: I don't know because --

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1 MR. SCHULZ: Yes, Graham, because we don't
2 have enough particles to come anywhere near the worst
3 particle-fiber ratio in AP1000 with 75 grams.

4 We would be operating at about five grams,
5 a ratio of five with AP1000. So we would be very
6 near, in fact, the pressure drop conditions, the test
7 conditions, for test 23. And the pressure drop there
8 is not that much larger. Okay?

9 What we did is something that we think is
10 very conservative. Now, yes, there's a lot of --
11 there's uncertainty in what we did. I'm not saying
12 there isn't. But what we did is we compared the
13 pressure drop that we got in -- I guess it's -- I'm
14 sorry. It's actually test 21 that had the highest
15 particle-fiber ratio of the 4.8, DP of 6.1 psi.

16 DR. WALLIS: You're assuming the
17 particle-fiber ratio curve is the same independent of
18 the amount of particles, --

19 MR. SCHULZ: Yes, which is the --

20 DR. WALLIS: -- which isn't necessarily
21 so.

22 MR. SCHULZ: That's true, but it's the
23 only data we have.

24 MEMBER BANERJEE: But your particles, I
25 mean, based on the number of amount you have

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1 postulated would be what, around 500 grams?

2 MR. SCHULZ: Of particles?

3 MEMBER BANERJEE: Yes if you use silicon
4 carbide surrogates for these experiments. Say you
5 kept your particles constant. I've forgotten how
6 much.

7 MR. SCHULZ: It's shown on the previous
8 slide.

9 MEMBER BANERJEE: What is that number
10 roughly?

11 MR. SCHULZ: It's like --

12 MEMBER BANERJEE: That's about 400 to 500,
13 --

14 MR. SCHULZ: Yes.

15 MEMBER BANERJEE: -- somewhere in that
16 range?

17 MR. SCHULZ: Yes. Yes. So what I'm
18 saying is that the 560 or so grams is the maximum that
19 is available in the plant.

20 MEMBER BANERJEE: Right. So let's say
21 about where you've got 363 in the owners' group
22 experiments, you would have something of the order of
23 550. That's the maximum you could have.

24 MR. SCHULZ: Yes, yes. So it would be
25 something above five and probably below ten.

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1 MEMBER BANERJEE: Okay. All right.

2 MR. SCHULZ: But what we did is we said,
3 "Well, let's make a plot that goes vertically through
4 this" --

5 DR. WALLIS: I seem to remember -- I'm
6 sorry. I seem to remember data where they had many
7 more fibers or something, where the particle-fiber
8 ratio at the maximum was one.

9 MR. SCHULZ: That's true.

10 DR. WALLIS: So it's quite different than
11 if you have --

12 MR. SCHULZ: Graham, different conditions.

13 DR. WALLIS: Yes, but you have assumed
14 that for all conditions, you've got the same shape of
15 curve.

16 MR. SCHULZ: No. For these flow
17 conditions. The big thing is that what you're talking
18 about is a flow of 45 gallons a minute. The beds
19 behave fundamentally different there.

20 MEMBER BANERJEE: This is three gpm,
21 right?

22 MR. SCHULZ: Yes. This is low flow rates,
23 AP1000-type flow rates, low flow. The beds develop
24 and form a single bed right at the inlet to the fuel
25 assembly.

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1 MEMBER BANERJEE: Why don't we let Terry
2 finish the story? And then we will come back and ask
3 you the questions. I want to hear the story.

4 MR. SCHULZ: Okay. So what we did is
5 extrapolate for the 75-gram case to try to estimate
6 what the maximum DP would be at the worst
7 particle-fiber ratio. And we just basically took the
8 curve we had at 18 grams, compared the DP at the
9 particle-fiber ratio of 4.84, which for 18 grams is
10 the .56 psi. So that's about a factor of 10.8 times
11 lower than the DP we got at the 75 grams.

12 So we basically just scaled that 18-gram
13 curve up to 75 grams by multiplying every point on the
14 18-gram curve by 10.8. And what that does, then, is
15 --

16 MEMBER BANERJEE: Using that red dotted
17 curve, right?

18 MR. SCHULZ: Yes. That makes that red
19 dotted curve. So it goes up around a DP of just over
20 16 at a maximum. And that maximum particle-fiber
21 ratio is in the range of 37-38.

22 DR. WALLIS: This 16 is a big
23 extrapolation, then?

24 MR. SCHULZ: Yes, it is a big
25 extrapolation and, again, extremely conservative.

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1 MEMBER BANERJEE: Let's see where you go
2 here.

3 MR. SCHULZ: Okay.

4 MEMBER BANERJEE: Let's give you this.

5 MR. SCHULZ: And we also did the same
6 thing for the orange curve there, which has a --
7 that's test 24, which has a particle-fiber ratio of --
8 what is that?

9 MEMBER BANERJEE: Twenty-one.

10 MR. SCHULZ: Twenty-one. There's another
11 curve in there that's almost on top of the 18-gram.
12 So it doesn't really help very much.

13 DR. WALLIS: So you were saying that the
14 ratio of the pressure drop is so that the portion, the
15 amount of fiber, the amount of pressure drop is
16 proportional to the amount of fibers? Those curves
17 are all the same, but they're in proportion to each
18 other.

19 MR. SCHULZ: As a function of
20 particle-fiber ratio, yes.

21 DR. WALLIS: Yes, but the same
22 particle-fiber ratio there, of course. The maximums
23 also are in the same proportion.

24 MR. SCHULZ: You draw a straight line up
25 from the particle-fiber ratio of about 37. something.

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1 DR. WALLIS: Right.

2 MR. SCHULZ: And then you would intersect
3 the blue line at a certain point and the orange line
4 at a higher point and the red line at a much higher
5 point.

6 DR. WALLIS: Those ratios would be the
7 same as every particle-fiber ratio.

8 MR. SCHULZ: Yes. And then we took those
9 points and plotted them on a graph of AP versus fiber.

10 So this point on the extreme right, the 16.4 psi, is
11 from the 75-gram point.

12 DR. WALLIS: So this is very different
13 from what I thought. I thought you actually plotted
14 data for your blue curve. Now you're plotting a huge
15 extrapolation.

16 MEMBER BANERJEE: Well, no. This is at
17 the worst particle-fiber ratio, right?

18 MEMBER SHACK: Let him go.

19 DR. WALLIS: It's not a data point. 16.4
20 isn't a data point. I thought you were applying data
21 points.

22 MR. SCHULZ: No. We told you yesterday
23 that for the higher -- we couldn't use numbers too
24 much. And we couldn't show you figures. And we were
25 afraid that it didn't communicate. So hopefully you

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1 at least understand what we did now.

2 DR. WALLIS: I understand now. Thank you.

3 MR. SCHULZ: Okay. The 16.4 is certainly
4 an extrapolation based on data but is an
5 extrapolation. And, again, we think it's conservative
6 because we don't have enough particles to support
7 that, which would drop the curve down. The 5.23 is
8 that 30-gram test.

9 And then there is a fair amount of data,
10 both AP1000 and owners' group, around 18 to 20 grams.

11 So there is directed data there. But trying to
12 figure out what happens at the higher ones, higher
13 conditions, is different.

14 MEMBER BANERJEE: Well, around the 30
15 grams, the yellow data point that you have is fairly
16 close. It's not quite at the maximum, but it is
17 almost there.

18 MR. SCHULZ: There's not that much
19 difference, yes.

20 MEMBER BANERJEE: So that data point is
21 fairly well-supported.

22 MR. SCHULZ: And that is a fairly
23 important data point as we go, as you will see.

24 MEMBER BANERJEE: And, actually, from our
25 point of view, that is probably the only one which is

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1 -- I mean, the rest of the curve may not be very
2 important to us, but that point is.

3 MR. SCHULZ: That point is very important,
4 yes.

5 Now, one thing you need to recognize, this
6 curve is done in three GPM.

7 MEMBER BANERJEE: Can I ask something? If
8 you for the purposes of us, if you didn't show the
9 16.4, which is much more -- you know, it may be very
10 conservative. Who knows? But only to get to 30 or
11 40. Wouldn't that serve your purpose up to 30? I
12 mean, that is a much better substantiated point. And
13 just cut the top off.

14 MR. SCHULZ: We could. We could. It
15 would --

16 MEMBER BANERJEE: It would be --

17 MR. SCHULZ: -- tweak the results a little
18 bit. You can see if you --

19 MEMBER BANERJEE: Would it change the
20 results at all?

21 MR. SCHULZ: Well, if you removed the
22 75-gram data point and best fit the other ones, you
23 can imagine the curve would be a little steeper. But
24 it's not going to fundamentally change it. We would
25 still end up with a lot of margin.

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1 DR. WALLIS: But it's not a data point.
2 You said it's a data point.

3 MR. SCHULZ: The 5.23 is very close to a
4 data point.

5 DR. WALLIS: You said the 60-75 was a data
6 point.

7 MR. SCHULZ: It's a data point on the
8 curve, yes.

9 MEMBER BANERJEE: I'm just trying to --

10 MR. SCHULZ: I didn't say it was a test
11 data point.

12 MEMBER BANERJEE: I'm just trying to make
13 our letter easier and our life easier. Okay?

14 MR. SCHULZ: Okay.

15 MEMBER ARMIJO: Terry, the orange curve,
16 why doesn't it go through zero and do a best fit
17 through a data point at zero? At least we can depend
18 on that.

19 MEMBER BANERJEE: It doesn't because the
20 point is it doesn't have to.

21 MEMBER ARMIJO: Why not?

22 MEMBER BANERJEE: Because you can still
23 have fiber.

24 MEMBER ARMIJO: Okay. All right. So --

25 MR. SCHULZ: If you actually look at --

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1 what is it? -- test 22, top left, 75 grams, they had
2 zero particles and still significant DP.

3 MEMBER ARMIJO: Okay. Okay. I
4 understand.

5 MR. SCHULZ: And so the fibers plus
6 chemicals can give you DP.

7 MEMBER ARMIJO: Okay.

8 MEMBER BANERJEE: And CIB 25, where is
9 that?

10 MR. SCHULZ: It's just very -- it's a
11 green line. It's just barely above the --

12 MEMBER BLEY: You can see it. It's right
13 above the third blue.

14 MEMBER BANERJEE: Okay. I see it.

15 MR. SCHULZ: It's only got 20 grams. So
16 it's very close to the 18 grams.

17 MEMBER BANERJEE: Wherever you are. Yes.
18 Okay.

19 MR. SCHULZ: It's not terribly useful
20 because it's so close to the 18 grams.

21 MEMBER BANERJEE: Now, the 30 grams, is
22 there only one point there or do you actually have
23 more data there?

24 MR. SCHULZ: This is --

25 MEMBER BANERJEE: The only point?

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1 MR. SCHULZ: -- the only data that --

2 MEMBER BANERJEE: Well, it's better than
3 nothing, I tell you. All right. I think we've got
4 the story.

5 MR. SCHULZ: Okay. And the only thing, to
6 the last one --

7 MEMBER BANERJEE: Yes.

8 MR. SCHULZ: And, unfortunately, this is
9 not an engineering plot here, but the only difference
10 between this plot and this plot is for this one, we
11 made a minor adjustment because this is at 3.1 GPM,
12 which is the AP1000 flow rate, because if you looked
13 at the previous one and you went over from 4.6, you
14 wouldn't exactly get 30 at the line. But that changes
15 slightly.

16 MEMBER BANERJEE: So if I took this line,
17 let's say I took that point, 5.23, if you take it to
18 the next slide, it will go down slightly, but --

19 MR. SCHULZ: Yes. You would raise the --

20 MEMBER BANERJEE: Line slightly.

21 MR. SCHULZ: Right. You would raise the
22 line slightly, which means that this, instead of being
23 30, would be --

24 MEMBER BANERJEE: But still it shows that
25 your current situation, you have lots of volume.

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1 MR. SCHULZ: Yes.

2 MEMBER BANERJEE: That is really what we
3 are after.

4 MR. SCHULZ: We can do that, yes.

5 MEMBER BANERJEE: I mean, I want a story
6 which is completely defensible so that we can write a
7 letter that nobody is going to come back and tell us
8 that --

9 MR. SCHULZ: We probably don't need a
10 factor of three or four margin here.

11 MEMBER BANERJEE: You don't need it,
12 right. Thank you. Very useful.

13 MR. SCHULZ: Okay.

14 MEMBER BANERJEE: I think you've got --

15 CHAIRMAN RAY: Is there anything else you
16 want to say, Terry? We're going to go over all of
17 this in a minute.

18 MR. SCHULZ: We still have --

19 CHAIRMAN RAY: Yes. Go ahead.

20 MR. SCHULZ: -- exactly how to formally
21 transmit this information, but --

22 7. OTHER CHAPTER 23

23 MR. CUMMINS: He just asked my question,
24 do you want it modified and how to submit it?

25 MEMBER BANERJEE: If you can modify it or

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1 make the slide and whatever and impose into the record
2 somehow --

3 CHAIRMAN RAY: Well, we're going to have a
4 meeting on December 1st, for example. That will have
5 a record in --

6 MEMBER BANERJEE: I think it would be
7 great if you can show the full Committee this. I
8 think it would set a lot of minds at rest, just this
9 one slide.

10 CHAIRMAN RAY: Well, we're going to talk
11 about that in a minute, Sanjoy, but I want to first
12 get to this --

13 MEMBER BANERJEE: I'm done.

14 CHAIRMAN RAY: All right.

15 MEMBER BANERJEE: Thank you.

16 CHAIRMAN RAY: You're welcome.

17 8. PLANS FOR FULL COMMITTEE

18 CHAIRMAN RAY: All right. Now, let's set
19 the stage here. We have a meeting on December 1st,
20 which I don't want to give up because inevitably there
21 are going to be some items, like we just discussed,
22 that we want to resolve. It may not be a long
23 meeting, but I don't want to assume anything at the
24 moment.

25 With that in mind, then, it seems clear in

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1 talking with staff that we're not going to be prepared
2 to write an AIA letter at the full Committee in
3 December. We may be prepared to write a GSI-191
4 letter, then. That will be up to Sanjoy, who is going
5 to take the oar of drafting such a thing.

6 MEMBER BANERJEE: Provided you buy me
7 dinner.

8 (Laughter.)

9 CHAIRMAN RAY: Only after they say, "We
10 have a letter."

11 MEMBER BANERJEE: Then it will be a dinner
12 at Michelin three-star.

13 (Laughter.)

14 CHAIRMAN RAY: And so the first thing to
15 say is that we need to try, as we were just doing, to
16 make sure that everything that we can do to make such
17 a thing happen is going to be done.

18 So I'm going to let Sanjoy, with all of
19 our help, make sure he restates. Even though it may
20 seem we're beating a dead horse here, I think it is
21 better to do that than to leave something undone, what
22 is needed for that letter. And then I will be
23 drafting the letter on the amendment itself.

24 I am going to start by using -- and both
25 of those possibly can get done at the December full

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1 Committee meeting. I don't see anything that prevents
2 it being done other than there are other things on the
3 agenda for December, much to my dismay. And we'll
4 have to see if we can get enough time at the full
5 Committee meeting in December to get both of those
6 things done.

7 MEMBER BANERJEE: Just one thing, Mr.
8 Chairman, that I really have to leave that Saturday
9 morning.

10 CHAIRMAN RAY: It will happen. And that's
11 why if you can produce a letter that the full
12 Committee can review, it will go first.

13 MEMBER BANERJEE: All right.

14 CHAIRMAN RAY: But we're not going to get
15 bogged down with GSI-191. All right?

16 MEMBER BANERJEE: I promise.

17 CHAIRMAN RAY: If I can --

18 MEMBER BANERJEE: I won't put any language
19 which the Committee will want to remove.

20 (Laughter.)

21 CHAIRMAN RAY: Well, there are two stages
22 of ACRS letter writing. One is to get the concepts
23 agreed upon and then to get the words agreed upon.
24 And the second stage is often more painful than the
25 first stage.

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1 MEMBER BANERJEE: Have we ever sat through
2 one of these?

3 MR. CUMMINS: We've never been invited.

4 (Laughter.)

5 CHAIRMAN RAY: Nor will you be.

6 MEMBER BANERJEE: It's a salutary
7 experience.

8 CHAIRMAN RAY: Yes. All right. It's the
9 best I can do. I'm trying to lay it out here. All
10 right.

11 So the point is on December 1st, we are
12 going to try and make sure that anything that's left
13 on the table here when we get up and quit now is taken
14 care of then. And then we are going to spend the rest
15 of the time, those of us who are involved here, trying
16 to produce two letters. And the two letters will
17 compete with each other for whatever time the full
18 Committee can give us.

19 MEMBER ARMIJO: Now, will the staff be
20 finished with everything they have on the shield
21 building so we can get that out of the way?

22 CHAIRMAN RAY: Well, that's what I want to
23 -- but I would rather go through that sort of
24 systematically and ask the parties involved here
25 because I can't keep all of this in my head and run

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1 this meeting at the same time. So it's easy for me to
2 have something that I've forgotten to take into
3 consideration in this respect. And that's one of the
4 questions.

5 MEMBER BROWN: Harold?

6 CHAIRMAN RAY: Yes?

7 MEMBER BROWN: Is it two letters or three
8 letters? Are we talking about all three: 191, AIA,
9 and --

10 CHAIRMAN RAY: No. I tried to say clearly
11 AIA is off the table because the staff may --

12 MEMBER BROWN: Okay. It's off the table.
13 Okay. All right.

14 CHAIRMAN RAY: -- won't be done by then.

15 MEMBER BROWN: That's fine.

16 CHAIRMAN RAY: And you can attribute that
17 to Thanksgiving week or whatever you'd like, but the
18 fact is I just don't see that happening.

19 MEMBER BROWN: Okay.

20 CHAIRMAN RAY: Also, to try and get three
21 letters to the Committee I think, with the other
22 things that they have already on the agenda, is not
23 going to be possible.

24 So, anyway, so now I want to go through
25 thoroughly both of these two letters, just in terms of

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1 what things remain outstanding, because we may
2 conclude, like AIA, that there is something that
3 precludes it from being done in December.

4 And in that case, if that were to happen,
5 then we can focus our attention more productively on
6 what can get done. But if there is something that
7 can't get done, believe me, it's not a good idea for
8 us to not do what we can do because we're still
9 wringing our hands over things we can't do.

10 All right. With that, then, Sanjoy, would
11 you like to go through? Weidong is here to help. I
12 use this as a checklist, but that may not be a great
13 checklist from your standpoint. But just --

14 MEMBER BANERJEE: I think I have in my
15 head what --

16 CHAIRMAN RAY: Can you enunciate it? And
17 do you think it will be done by December 1st assuming
18 they walk in here with some slides that --

19 MEMBER BANERJEE: Yes.

20 MR. WANG: It looks like from the -- I
21 think it looks like from me we have cleared up most of
22 the action items.

23 CHAIRMAN RAY: Anything that involves the
24 staff in GSI-191?

25 MR. WANG: Not that I'm aware of.

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1 CHAIRMAN RAY: Eileen?

2 MS. McKENNA: I'm sorry, sir?

3 CHAIRMAN RAY: That's all right. It's
4 okay. It's okay.

5 MS. McKENNA: Yes?

6 CHAIRMAN RAY: The question is, is there
7 anything that you're doing that involves GSI-191 that
8 we should be aware of that you owe us or that you
9 might --

10 MEMBER BANERJEE: You've already addressed
11 the full Committee, right?

12 MS. McKENNA: I think so. I think the
13 staff has provided everything that it has. And at
14 this point, I think the applicant is trying to answer
15 these additional questions that the Committee has.
16 But staff is not quite doing anything different.

17 CHAIRMAN RAY: All right. Well, I need to
18 ask.

19 DR. WALLIS: Who will decide what it
20 thinks about the blue curve independent of what the
21 staff doesn't think. And the staff hasn't said
22 anything about it.

23 CHAIRMAN RAY: I'm not following you. But
24 direct your question to Sanjoy, would you?

25 DR. WALLIS: You had some new evidence

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1 presented today, which the staff had nothing to say
2 about. That's okay if the Committee wants to go ahead
3 and use that without any input from the staff if they
4 want to do that.

5 CHAIRMAN RAY: That's a question for
6 Sanjoy.

7 MEMBER BANERJEE: Okay. That's fine by
8 me.

9 CHAIRMAN RAY: All right. Yes is the
10 answer --

11 (Laughter.)

12 DR. WALLIS: That's okay. Thank you.

13 CHAIRMAN RAY: -- unless one other member
14 speaks up and says that it's okay with them.

15 MEMBER BANERJEE: This is the full
16 Committee.

17 CHAIRMAN RAY: I understand that. Right
18 now it's okay with me. It's okay with him. Is it
19 okay with you?

20 MEMBER SHACK: Yes. I mean, we're going
21 to have to come to our own decision on this.

22 CHAIRMAN RAY: Yes.

23 MEMBER SHACK: And the staff has already
24 come to their decision. Now it's up to us. Okay?
25 We'll use whatever we have and we want.

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1 CHAIRMAN RAY: Sam, you wanted to say
2 something?

3 MEMBER ARMIJO: Yes. I just didn't know
4 if we'd done it before as a Committee.

5 MEMBER BANERJEE: We have.

6 MEMBER ARMIJO: Okay. So there's no
7 problem.

8 MEMBER BANERJEE: On many issues.

9 (Laughter.)

10 MEMBER ARMIJO: I'll say.

11 CHAIRMAN RAY: Just in the short time I've
12 been here. That's not a problem. Okay. All right.

13 MEMBER BANERJEE: Now, we may discuss with
14 Westinghouse a short presentation, which I think
15 should be made to the full Committee if you agree.

16 CHAIRMAN RAY: Yes, absolutely, whatever
17 you think it takes to get the --

18 MEMBER BANERJEE: I don't think it needs
19 to be very long, but I think it should summarize. We
20 can discuss it offline or now or whatever. We can
21 give our views to Westinghouse. But I think it would
22 be useful to have a presentation made by Westinghouse
23 to the full Committee.

24 CHAIRMAN RAY: The only thing I would ask,
25 Sanjoy, is that you be mindful in that request of the

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1 fact that we did take a couple of hours for the full
2 Committee.

3 MEMBER BANERJEE: Yes, sir. That's why
4 I'm saying it's only what new things have been done.

5 CHAIRMAN RAY: And I think, really, that
6 is a decision that you need to make because at the end
7 of the day, it is the letter that you're going to --
8 it's all of our letter, but, I mean, all of us take
9 ownership of it, but you're going to draft the letter.

10 And the question is, what is it that you
11 would like to have Westinghouse do to help you get
12 that letter approved? So you can address it to them
13 right now or you can say, "I want to think about it"
14 or whichever way you want to go.

15 MEMBER BANERJEE: Well, why don't we go
16 around? Let me give it some thought.

17 CHAIRMAN RAY: All right.

18 MEMBER BANERJEE: And then by the end of
19 the meeting, I'll have my thoughts organized.

20 CHAIRMAN RAY: Okay. All right. So we're
21 going to shift gears now. And we're just talking
22 about the letter on the -- and things like the shield
23 building and I&C and PRA and whatever anybody can
24 think about. In that regard, where do we stand,
25 Sanjoy, on your request about metallographic?

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1 MEMBER BANERJEE: I went through that
2 report. Actually, a lot of it has to do with
3 radiation damage at pretty high doses to these
4 coatings. Have you looked into those? Have you
5 looked at it, Sam?

6 MEMBER ARMIJO: No, I haven't seen it.

7 MEMBER BANERJEE: And quite a bit of it
8 has to also do with epoxy layer, which is put on the
9 zinc coating. I think from my point of view, it was
10 informational, that there is nothing that I have in
11 terms of an issue that, if you want, I can give this
12 to you guys now to read, some light reading. I've
13 been through it. It is interesting.

14 MEMBER ARMIJO: I have been reading about
15 manganese steels. So I might as well read this.

16 MEMBER BANERJEE: And, Bill, you probably
17 know this.

18 MEMBER SHACK: No. I mean, this may be
19 more relevant to some other issues we're discussing
20 than this particular one.

21 MEMBER BANERJEE: Well, I was interested
22 in it from the point of view of what sort of effect it
23 might have on GSI-191.

24 MEMBER SHACK: Well, anything that affects
25 containments affects some of our other interests, too.

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1 MEMBER BANERJEE: So, you know, you have
2 to work fairly high dose rates to get really high
3 damage.

4 CHAIRMAN RAY: Okay. I took that out of
5 turn because I thought you were going to then start
6 thinking. And I didn't want to interrupt your
7 thinking.

8 So I'm going to start now with open item
9 number 1. Yesterday we focused on closed items.
10 Today we're focusing on open items. Item number 4,
11 Sam, is the flywheel. I believe that -- I shouldn't
12 say what I believe. Do we have all the input that you
13 feel that --

14 MEMBER ARMIJO: I've got all the input
15 that -- and I did review some of the papers in that
16 EPRI workshop. And, you know, I think the more I read
17 about the history of problems with the high manganese,
18 low chromium material, how the generator guys got into
19 big trouble because they didn't test it convinces me
20 that we have to test the 18 manganese, 18 chrome. And
21 I can write up some notes to that effect, but it does
22 not close the issue with me.

23 CHAIRMAN RAY: That's fine. All right.
24 Well, rather than notes -- I mean, maybe you want to
25 write notes, but let's assume for just the sake of

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1 argument right now and, you know, so everybody will
2 know where I am coming from, I understand the position
3 to be, that it not being a safety issue makes it a
4 higher-hurdle issue to raise.

5 Sam feels like it might be a safety issue.

6 I did earlier. It wouldn't take a lot to convince me
7 that it was again. But, in any event, at this point I
8 am just looking at it from that narrow point of view.

9 MEMBER ARMIJO: Yes. And I chose not to
10 address that yet, but I think there's GDC 10, where
11 you could -- I don't know how you want to read it.
12 You could make it a safety issue.

13 CHAIRMAN RAY: All right. That's fine.

14 MEMBER ARMIJO: I'm looking at it as an
15 engineering problem.

16 CHAIRMAN RAY: Yes.

17 MEMBER ARMIJO: And it's not a comfortable
18 situation.

19 CHAIRMAN RAY: Okay. We won't close it,
20 Weidong, just because I feel like we'll leave it
21 active, but we're not asking for anybody to give us
22 anything. Okay.

23 We had quite a discussion on 6 today. We
24 I think agreed to leave at least question 1 out of the
25 4 in 6. In any said, Said will want to participate.

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1 Tom gave some input. Tom, are you going
2 to put something in your report about 6? This has to
3 do with the flow distribution.

4 MR. KRESS: Yes, especially after I read
5 that report.

6 CHAIRMAN RAY: Yes. So it's definitely
7 open. And I guess I would say, Ed, that as
8 repetitious as it might seem to you, I would like it
9 if somebody can address on December 1st this item
10 further.

11 MR. CUMMINS: Yes.

12 CHAIRMAN RAY: I know it seems like going
13 back to the well again and again.

14 MR. CUMMINS: No, no, no.

15 CHAIRMAN RAY: All right.

16 MR. CUMMINS: That's fine.

17 CHAIRMAN RAY: Item 10 --

18 MEMBER SHACK: Do you understand what the
19 issues are now? I mean, you know, that may --

20 MR. CUMMINS: I think so.

21 MEMBER SHACK: Okay.

22 CHAIRMAN RAY: Okay. Item 10, I thought
23 we ended there on a -- what will I call it? -- a Dana
24 Powers note. Is that the right way to put it? Bill,
25 I'm looking to you for some help here on 10.

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1 Are we asking for an input, further input,
2 from -- I can't assure you that Dana will be here on
3 the 1st. He will be here on the 30th, I think, for
4 EPR. So he might be here on the 1st.

5 Should we ask Westinghouse for a
6 presentation on this issue? And if so, can we help
7 them define the problem?

8 MEMBER SHACK: Well, I mean, there is
9 Graham's issue with it, and there is Dana's issue. I
10 think Dana's issue is a purely statistical one that's
11 hard to find a physical basis for. Graham's question
12 of whether the reasonable assumption is to assume a
13 uniform distribution of fibrous material or a uniform
14 K over A squared as you go around and how you would
15 treat those in a statistical fashion --

16 DR. WALLIS: I was going to write
17 something up about -- I've got to think about that
18 one.

19 MEMBER SHACK: -- is the more difficult
20 problem.

21 DR. WALLIS: We've got to somehow take
22 this one test to test on one element and somehow say
23 how the whole core will behave. That is not a trivial
24 question.

25 CHAIRMAN RAY: No. I understood that much

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1 of the discussion, not much more, but that much of it
2 I did. So I guess I would say that on 10, we have a
3 could of areas where I don't know what more to ask for
4 from Westinghouse. This is what I am trying to get
5 framed. What is it that we want --

6 DR. WALLIS: Item 10?

7 CHAIRMAN RAY: What?

8 DR. WALLIS: Are you on item 10?

9 CHAIRMAN RAY: Yes.

10 DR. WALLIS: Item 10 is something
11 completely different.

12 CHAIRMAN RAY: Say it again.

13 DR. WALLIS: It has nothing to do with
14 GSI-191.

15 MEMBER SHACK: This is the measurement
16 uncertainty.

17 CHAIRMAN RAY: I didn't say anything about
18 --

19 DR. WALLIS: That's why he --

20 MEMBER SHACK: No. Dana didn't raise this
21 issue.

22 MEMBER BANERJEE: GSI-191 discussion.

23 MEMBER SHACK: You raised Dana's issue,
24 which is a GSI-191 statistical thing. This is --

25 CHAIRMAN RAY: Before I did that, I asked

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1 the question, is this Dana's issue?

2 MEMBER SHACK: No.

3 CHAIRMAN RAY: And you were busy --

4 MEMBER SHACK: The answer is no.

5 CHAIRMAN RAY: Okay. The answer is no.

6 All right. Let's start over again. What do we need
7 on 10, if anything? Because a statistical issue came
8 up. That's what triggered Dana, the thought that Dana
9 --

10 DR. WALLIS: What we had was we had a
11 presentation by Westinghouse. They had the method of
12 reducing the uncertainty by looking at lots of
13 different measurements. Then Sanjoy said, "What is
14 your approach?"

15 So they came back and sent us some
16 e-mails. And I read this stuff. And it seemed to me
17 from my own analysis that, yes, the approach was fine
18 for Gaussian distributions of uncertainties. And the
19 question in my mind was then, could Westinghouse
20 justify that these measurements were reasonable
21 approximations to Gaussian uncertainties? If they
22 were spires, it couldn't be taken out this way, for
23 example.

24 So we haven't yet had anything from
25 Westinghouse about what their method is and why this

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1 applies to the measurement they're going to use it on.

2 We haven't had anything from that.

3 MEMBER BANERJEE: Well, it may not work
4 with bias.

5 DR. WALLIS: Do we want to pursue it or
6 not?

7 CHAIRMAN RAY: Well, I have to ask you a
8 question, which is, could it be significant?

9 DR. WALLIS: Well, if they want to --
10 well, it's really for the -- the staff is going to
11 approve this method. That's the question.
12 Significant for what?

13 CHAIRMAN RAY: For anything that we are
14 concerned about.

15 DR. WALLIS: Well, what are they going to
16 do with this flow measurement?

17 CHAIRMAN RAY: The usual things they do.

18 DR. WALLIS: Staff to make some decision
19 about power uprate.

20 CHAIRMAN RAY: Yes.

21 DR. WALLIS: I have pointed out some
22 things about it. I am not really in a position of
23 deciding, is it significant or not?

24 CHAIRMAN RAY: Okay. Fine. Sanjoy, did
25 you have a chance to look at this?

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1 MEMBER BANERJEE: I know the problem. I
2 know Graham's. He wrote a white paper on it. I read
3 it. It seems correct. I don't know what to do with
4 it. I mean, has Westinghouse --

5 DR. WALLIS: I don't think the staff
6 should consider. The staff is going to decide whether
7 or not to approve this for power uprates. Really,
8 it's up to the staff to decide, are they going to
9 accept what Westinghouse does or not in the light of
10 the --

11 CHAIRMAN RAY: Well, at this point in
12 time, we're trying to figure out what we are going to
13 do about it. So go ahead with your question, Sanjoy.

14 MEMBER BANERJEE: I was going to say, has
15 your white paper been transmitted to ACRS?

16 DR. WALLIS: Well, I would --

17 MEMBER BANERJEE: I mean, it would
18 normally be transmitted to the staff.

19 DR. WALLIS: Well, I've sent various
20 reports and e-mails to Weidong. So that --

21 MR. WANG: Every e-mail and your comments
22 --

23 DR. WALLIS: If you want a summary of the
24 conclusions and everything, I can do that, too.

25 MEMBER BANERJEE: I mean, I'm not very

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1 comfortable dealing directly with Westinghouse.

2 CHAIRMAN RAY: That's fine. It sounded
3 like you wanted to ask them a question.

4 MEMBER BANERJEE: Well, I was simply
5 saying that if this was sort of made available to
6 them, they would have a chance to say what they felt
7 about it. I don't know if they have even seen it.

8 CHAIRMAN RAY: All right. Okay. Here is
9 what we will do.

10 Eileen, if you guys want to respond on
11 this subject, let's do it on the 1st.

12 MS. McKENNA: Well, I just wanted to
13 clarify the question about -- I'm not sure when you're
14 asking about the power uprates where you were perhaps
15 thinking about power measurement uncertainty versus
16 reactor coolant system.

17 DR. WALLIS: If it was just power
18 measurement uncertainty, you can buy a little bit of
19 --

20 MS. McKENNA: That's not what this is.

21 DR. WALLIS: It's not what it is?

22 MS. McKENNA: No, no.

23 DR. WALLIS: What is it?

24 MS. McKENNA: This is reactor coolant
25 system flow.

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1 MEMBER BANERJEE: It's a flow measurement.

2 MS. McKENNA: Flow measurement, right.

3 DR. WALLIS: But you have a penalty on
4 power because of uncertainties in the flow
5 measurement, don't you?

6 MS. McKENNA: That's not --

7 PARTICIPANT: Feedwater flow.

8 MS. McKENNA: That's not a feedwater flow.

9 This is --

10 DR. WALLIS: Isn't that what this is
11 about?

12 MS. McKENNA: No, it's not.

13 DR. WALLIS: Well, what --

14 CHAIRMAN RAY: RCS flow is the first line
15 on 10.

16 MEMBER BANERJEE: Yes. It's using
17 pressure taps as well as different means.

18 DR. WALLIS: For what purpose?

19 MEMBER BANERJEE: Well, it can measure RCS
20 flows.

21 MS. McKENNA: It's an alternative way of
22 measuring reactor --

23 DR. WALLIS: But, then, what safety issue
24 does that address?

25 CHAIRMAN RAY: DMBR, doesn't it?

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1 MS. McKENNA: Yes.

2 DR. WALLIS: So I'm not in a position to
3 say how the uncertainty affects the NBR.

4 MR. CUMMINS: Yes. There really is
5 extreme difficulty in correctly measuring RCS flow,
6 but there might be ways to say that it changed from
7 whatever the baseline is.

8 And there is a tech spec that forces you
9 to measure it -- I don't remember -- every month or
10 every some period and so that it didn't degrade. And
11 the fact that you never really measured it very well
12 the first time didn't really get into the equation.

13 CHAIRMAN RAY: That's one way to look at
14 it, I would think. I am just trying to get at the
15 point of, what is it relevant to? He's saying it's
16 relevant to change, not to absolute value, right?

17 MR. CUMMINS: If it degrades, it might
18 affect DMB.

19 CHAIRMAN RAY: Yes.

20 MR. CUMMINS: I mean -- yes.

21 CHAIRMAN RAY: But the reason you are
22 measuring it is because you want to identify a change
23 --

24 MR. CUMMINS: Yes.

25 CHAIRMAN RAY: -- not because you're using

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1 the measurement to --

2 MR. CUMMINS: Set power or any --

3 CHAIRMAN RAY: -- set power levels in the
4 core.

5 MEMBER BANERJEE: There is a calibration
6 that you do, right, right at the beginning to set --

7 CHAIRMAN RAY: Yes. We had a presentation
8 on that, as I recall.

9 MR. CUMMINS: Yes. I mean, there are many
10 ways you try it. One of the ways is you calibrate it
11 against feedwater, which is probably the best way, but
12 --

13 CHAIRMAN RAY: That's the way we have all
14 done it.

15 MR. CUMMINS: Right. So we mentioned
16 seven or eight ways. And some of them when you -- all
17 of them have errors. And when you use all of them
18 together, the error is smaller.

19 CHAIRMAN RAY: Okay. Well, I am not going
20 to give up on this until I get it run to ground. As I
21 recall, the issue came up in the way that it's stated
22 here, which is we are going to measure flow. Ed is
23 asserting detect changes or degradation in flow. I
24 thought it was being measured in order to get a more
25 accurate number to reduce the penalty, in other words,

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1 that you're having to assume.

2 MR. CUMMINS: No, no.

3 CHAIRMAN RAY: Okay. All right. If
4 that's not the case, that's fine. So should we pursue
5 this further? And, if so, what should we do? I'm not
6 asking Graham now. I'm asking you, Sanjoy and Bill
7 and anybody else who has an opinion.

8 MEMBER SHACK: Well, if it's only deltas
9 they are worried about, then the bias problem becomes
10 reduced --

11 CHAIRMAN RAY: Yes.

12 MEMBER SHACK: -- because the bias will
13 disappear. And it seems to me that, even if you don't
14 believe the distribution is Gaussian, weighting the
15 measurement by the standard deviation, whatever
16 probability distribution you are doing is probably a
17 better way to combine measurements.

18 DR. WALLIS: Even if there was bias before
19 and now it's after, it couldn't get worse.

20 MEMBER SHACK: Yes.

21 MR. CUMMINS: I mean, I suppose that
22 before we put too much weight on only paying attention
23 to change, if we decided that the flow was much
24 different than our design flow, that would be a
25 concern by everybody.

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1 So the initial one makes some difference,
2 but it really is not used to set the power. If it was
3 way off, we would have to think about how we would set
4 the power. After that, I think the tech spec is
5 mostly intended to make sure that it doesn't decrease.

6 MEMBER SHACK: No statistical treatment
7 would deal with bias. I mean, you have to deal with
8 bias either by calibrating your instruments,
9 developing a new theory --

10 MEMBER BANERJEE: That's what I was
11 saying, that you have a means of calibration in the
12 beginning.

13 MEMBER SHACK: In which case, you know,
14 you then presume that your bias errors are small
15 enough to be acceptable and you are dealing with
16 statistical errors. And is it Gaussian? Well, who
17 knows? I mean, but it's probably close enough to
18 assume that this is the best way you can combine the
19 measurements.

20 MEMBER BANERJEE: I suppose the real
21 question is, can you with your calibration take care
22 of the bias if there are biases? This is maybe --
23 this is the only question that is significant.

24 DR. WALLIS: Well, how do you calibrate
25 the code? One of these measurements is based on the

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1 pressure drop predicted if I understand by codes.

2 That's not --

3 MEMBER BANERJEE: But you can do it in the
4 beginning. Because they have an absolute calibration
5 against a heat -- the feedwater, right? Isn't that
6 fair? I mean, I am trying to understand.

7 MR. CUMMINS: We do absolutely measure it
8 against feedwater, but what we divide by is delta T.
9 And the TH part of delta T is hard to measure.

10 MEMBER BANERJEE: Yes, yes, yes.

11 DR. WALLIS: I would think until it's used
12 for some purpose that involves safety, the ACRS has no
13 concern.

14 CHAIRMAN RAY: Well, I wish I had a memory
15 adequate. I just was left with the impression we were
16 doing this because it would give us a better measure
17 of flow and we could reduce the uncertainty that we
18 had to include in the core thermal hydraulic
19 calculations. I thought that's why we were doing it.

20 MEMBER SHACK: Well, I wasn't here.

21 CHAIRMAN RAY: Okay. Well, Weidong says
22 I'm right.

23 MR. WANG: I think I remember this is --

24 CHAIRMAN RAY: And so I don't want to
25 dismiss it as not relevant to anything, but I am not

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1 the thermal hydraulic guy. I am only trying to -- the
2 paper was provided to those who are expert in this
3 area. And I'm just trying to find out, what should we
4 do now?

5 MR. CUMMINS: We have a minimum design
6 flow, which is a DMB thing. And if we weren't
7 confident that we had met that minimum design flow at
8 the start, we would have a problem, though we were
9 kind of discussing that the errors would -- you have
10 some error range. And it will be easier to determine
11 that we do have minimum design flow than what the
12 actual real flow is.

13 CHAIRMAN RAY: Here's what we're going to
14 do. Weidong, go look up -- not now but when we're
15 done, look up the presentation that was given to us.
16 Send it to everybody and say, "Here is the
17 presentation that was given that resulted in action
18 item 10. The references that were called for after
19 several go-arounds here were provided. And it's up to
20 the members to decide whether there is anything
21 further required." Okay?

22 MR. WANG: Yes.

23 CHAIRMAN RAY: Is that all right, Sanjoy?
24 All right. Carrying on, we've got to close 11, close
25 37. Forty-six is a COL item. Forty-eight, 49 are

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1 closed. So are 50, 51, 52, 53, 55, 56, 57.

2 Sixty. Sixty is the one that has to do
3 with the discussion we were trying to have earlier
4 about flow distribution on the outside of containment.

5 Are we going to get more on that subject?

6 I'm trying to recollect now where it was finally
7 left. We were going to see some movies or something?

8 What was it? Tell me what happens next.

9 MR. MELTON: Yes, sir. We're planning on
10 coming back on December 1st with some pointed
11 information to address the flow, what we're talking
12 about.

13 CHAIRMAN RAY: Thank you. All right.
14 Well, make sure Said knows that we're going to be
15 doing that in the December 1st meeting. Okay?

16 MEMBER BANERJEE: And maybe also Said has
17 issues relating to what is the manometric number, what
18 is the relationship of thin breakdown into rubulettes
19 that you are far away from these conditions? I think
20 that is more or less --

21 CHAIRMAN RAY: Yes. And we're going to
22 try, but we are not going to make a hard barrier.
23 We're going to try and recognize that to some extent
24 we're revisiting stuff that's been talked about in the
25 past. But now it enters the thought process again as

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1 a result of this amendment.

2 Okay. Sixty-two, 63, and 64 are COL
3 items. Sixty-five is closed in terms of additional
4 input required, but -- well, it's just closed.

5 MEMBER BROWN: It's the -- all we've got
6 to do is see. We talked some more.

7 MS. McKENNA: Test plan I think --

8 MEMBER BROWN: It's the test plan, how
9 it's going to be reflected in an ITAC. We had some
10 discussions on that.

11 CHAIRMAN RAY: Okay. Sixty-seven is a COL
12 item. And then we're into 68. Sanjoy, let's see.
13 You had some action items on 68, 69. This is the
14 COBRA/TRAC and --

15 MEMBER BANERJEE: I'm not following this
16 because I am trying to --

17 CHAIRMAN RAY: I know you are.

18 MEMBER BANERJEE: -- work on something
19 else.

20 CHAIRMAN RAY: I'm trying to get your
21 attention now because I need it.

22 MEMBER BANERJEE: All right.

23 CHAIRMAN RAY: Sixty-eight and 69 are
24 COBRA/TRAC nodalization we had nice discussions
25 about. And you got some more information today.

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1 MEMBER BANERJEE: But I think all the
2 GSI-191 items are closed now.

3 CHAIRMAN RAY: Well, I don't want to skip
4 over this. This is 68. If I could ask you to just
5 take a look at it so I don't make anything go away
6 prematurely. Yes. Just glance down that, would you
7 please, and tell me if there is anything left?

8 MEMBER BANERJEE: I think all of those are
9 closed.

10 CHAIRMAN RAY: All right. That's what you
11 and I wrote last time.

12 MEMBER BANERJEE: Yes.

13 CHAIRMAN RAY: And 69 is on the next page.
14 If you would look at that, too, please? Thank you.

15 MEMBER BANERJEE: There is a little bit of
16 ongoing discussions, but essentially that is closed.

17 CHAIRMAN RAY: All right. So I am going
18 to say that 68 and 69 are closed as a result of what
19 happened today. Okay?

20 MEMBER BANERJEE: Seventy is closed.

21 CHAIRMAN RAY: Yes. That's right.

22 MEMBER BANERJEE: Seventy-one is closed.

23 CHAIRMAN RAY: And that was going to be my
24 question. How about 71? You're satisfied with that?

25 MEMBER BANERJEE: Right.

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1 CHAIRMAN RAY: And that brings me to 72.
2 And, Charlie?

3 MEMBER BROWN: Which items?

4 CHAIRMAN RAY: Seventy-two. Help me here
5 again.

6 MEMBER BROWN: I had 72 a minute ago. And
7 now --

8 MEMBER SHACK: Spurious action with EDS.

9 CHAIRMAN RAY: Yes. The issue I think at
10 the moment is you have in mind a problem or not a
11 problem, a concern in the area of --

12 MEMBER BROWN: I'm comfortable without
13 testing the valves post-seismic operability.

14 CHAIRMAN RAY: Okay. But I was thinking
15 about the thing that came to your mind in terms of,
16 well, all right. We put the block in for the common
17 mode failure.

18 MEMBER BROWN: I don't have any -- yes.
19 Yes. I'm separating the block.

20 CHAIRMAN RAY: All right.

21 MEMBER BROWN: The block part I don't have
22 any problem with. It's the other issue. I won't say
23 I don't have a problem with that because they haven't
24 come through it yet. They are still doing their
25 evaluation in terms of impact. So until when the

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1 staff is finished with their evaluation, then I'll
2 determine whether I'm happy or not.

3 Is that fair, Eileen?

4 MS. McKENNA: Yes. I just want to
5 recognize that that won't be before December.

6 CHAIRMAN RAY: Well, that means we've got
7 to come up with a comment if you want to preserve it
8 formally.

9 MEMBER BROWN: Okay.

10 MS. McKENNA: Right.

11 CHAIRMAN RAY: If you will try and do
12 that? And then, Dennis, we have got the 30-day manual
13 out-of-service DAS concern that you were thinking
14 about.

15 MEMBER BLEY: And that's linked in with
16 the investment protection on the outer DAS and the
17 credit that's given in the PRA. And I have to chase
18 that a little when we get back together.

19 CHAIRMAN RAY: All right. We'll leave
20 that open. And then, finally, 73 is I think the one
21 you were speaking about or you thought I was asking
22 about to start with. It's the last one here.

23 MEMBER BROWN: Seventy-three is? Just
24 tell me. I haven't turned the page to that yet.
25 Turbine overspeed is just a matter of what they are

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1 going to do with the 120 percent --

2 CHAIRMAN RAY: Yes.

3 MEMBER BROWN: -- response time
4 verification. And I gave a --

5 DR. WALLIS: That's closed. We're talking
6 about part 2 now.

7 MEMBER BROWN: Only item 2?

8 CHAIRMAN RAY: That's right.

9 MEMBER BROWN: There were three questions.
10 One and 3 are closed.

11 CHAIRMAN RAY: Right.

12 MEMBER BROWN: Two is still open.

13 CHAIRMAN RAY: That takes care of using
14 the open items as a checklist. Now, Sam, you asked a
15 question about staff review of the shield design and
16 when the staff was going to be done with the review of
17 the shield design.

18 MEMBER ARMIJO: Yes.

19 CHAIRMAN RAY: What do we have in --

20 MEMBER ARMIJO: Those were the inspection
21 result reports that AIA-related --

22 CHAIRMAN RAY: AIA-related.

23 MEMBER SHACK: Design basis?

24 MEMBER ARMIJO: Yes.

25 MEMBER SHACK: They're done, right?

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1 MEMBER ARMIJO: Yes.

2 CHAIRMAN RAY: Anything other than
3 AIA-related?

4 MEMBER ARMIJO: No.

5 CHAIRMAN RAY: Okay.

6 MS. MCKENNA: We'll have to get back to
7 you on exactly when the staff is ready to talk about
8 the NOV responses, but I don't think it would be
9 December 1st because of the holiday and discussion.
10 But as soon as we can, we will let the Committee know.

11 CHAIRMAN RAY: Yes. Well, trying to
12 squeeze three AP1000 letters through the --

13 MS. MCKENNA: It's probably --

14 CHAIRMAN RAY: -- full Committee isn't
15 going to be very easy anyway.

16 All right. Okay. Is there anything,
17 Eileen, to your knowledge, that I have left out of
18 this recitation?

19 MS. MCKENNA: No. I think that captures.
20 That matches my list that I was keeping as we went.

21 CHAIRMAN RAY: Westinghouse, I don't
22 expect you to add things to my list, but there may be
23 something lurking that you want to address because you
24 know it will come up again if you don't. So is there
25 anything you have in mind?

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1 MR. CUMMINS: I hope not. I don't know of
2 anything.

3 CHAIRMAN RAY: All right. Any of the
4 members here have anything they want to add? What is
5 that?

6 MEMBER SHACK: What did we decide about
7 37?

8 CHAIRMAN RAY: Thirty-seven.

9 MEMBER BROWN: That's the statistical
10 analysis of the GSI-191 tests.

11 MEMBER BANERJEE: I had that --

12 CHAIRMAN RAY: I had it crossed off
13 because -- excuse me.

14 MEMBER BANERJEE: I had that as part of my
15 list of things that they would need to briefly
16 address, but I don't know what approach to take.
17 That's --

18 CHAIRMAN RAY: Well, I was going to turn
19 it over to you for your list now that I gave you such
20 a short amount of time to think about your list.

21 MEMBER BANERJEE: Well, one of the items
22 was clearly this thing that Dana brought up. I'm not
23 quite sure what Westinghouse has to do about it. It's
24 what we might need to do ourselves to look at it and
25 come to some sort of a conclusion.

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1 Graham was going to take a look and maybe
2 write a white paper, which we could send to Dana for
3 comments. I mean, the main concern is coming from
4 Dana.

5 DR. WALLIS: Was I --

6 MEMBER BANERJEE: I am asking your advice
7 on how you think we should deal with this.

8 DR. WALLIS: As I understand it, Sanjoy is
9 writing a letter on just AP1000. I will try to get
10 material to Sanjoy which will help him write that
11 letter. I think we'll cover this as well as some of
12 the other questions.

13 CHAIRMAN RAY: Right. You and Tom are --

14 MEMBER BANERJEE: And then we're going to
15 need to get --

16 CHAIRMAN RAY: We're going to need to get
17 input to it.

18 Yes? Go ahead.

19 MEMBER BANERJEE: We need to get this to
20 Dana because he's the person who is going to be
21 assigned about it. He brought it up with me before.

22 CHAIRMAN RAY: Well, I think he's going to
23 be in -- isn't there an EPR meeting on the 30th of
24 November?

25 MEMBER BANERJEE: Yes.

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1 CHAIRMAN RAY: Okay. Then I believe we
2 need to corner him on the 1st and make sure that --

3 MEMBER BANERJEE: If he's available.

4 CHAIRMAN RAY: -- we run it to ground.

5 MEMBER BANERJEE: If he hasn't gone off to
6 France or something.

7 CHAIRMAN RAY: That's right. I'm going to
8 believe that he will. So the 1st we want to try and
9 get that done.

10 Right now it looks to me like the 1st is
11 likely to be not more than a half-day meeting. But I
12 don't want to fail.

13 MEMBER BANERJEE: I don't believe that.

14 (Laughter.)

15 MEMBER BANERJEE: I mean, if they have to
16 deal with the CFD calculations and --

17 CHAIRMAN RAY: All right. But you also
18 need to give them guidance on what you want them to
19 present to the full Committee on GSI-191. I've got to
20 do the same thing on the amendment.

21 MEMBER BANERJEE: Right. I was going to.
22 So, if you want, why don't we discuss it? I'll give
23 you those points. And then if we are in agreement,
24 then Westinghouse can --

25 MEMBER SHACK: I mean, there's containment

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1 cooling. There's VIPER. I can't see how we could
2 possibly do this in a more --

3 (Whereupon, the foregoing matter went off
4 the record briefly.)

5 CHAIRMAN RAY: Fine. So it's a whole-day
6 meeting. That's what I wanted it to be anyway. Now,
7 yes. Go ahead. And I certainly agree because at this
8 point in time, what we want Westinghouse to do is to
9 begin thinking about the full Committee meeting. And
10 so if you've got in mind what you'd like them to
11 address?

12 MEMBER BANERJEE: Well, what I thought is
13 they could give a brief summary of the things that
14 they produced as information which has allowed us to
15 close out all the open items. I mean, number 68 or
16 something, we could name an open item by the issue
17 that was involved there and briefly summarize the
18 information that was brought in front of us about this
19 open item.

20 Now, that's okay, but at the end, what
21 would be I think important is to show that, even if we
22 are uncertain about, let's say, the loss factors of
23 pressure losses, whichever way you want to phrase
24 that, as well as the fiber content and the effect of
25 the different parameters. We have quite a lot of

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1 margin to any condition which can lead to dryout or to
2 boron deposition. And I think that's the bottom line,
3 which will allow us to write the letter.

4 So I wouldn't exaggerate and show points
5 at 16.4, something. I'd rather be very conservative.

6 I mean, I can't speak for you, but that's the way I
7 would be to get it through.

8 CHAIRMAN RAY: Keep in mind that I will
9 refer back to the presentation made to the full
10 Committee previously.

11 MEMBER BANERJEE: Right. Don't repeat the
12 stuff.

13 CHAIRMAN RAY: And I'm going to say we're
14 not going to repeat general information that was
15 provided then.

16 MEMBER BANERJEE: It's always nice to have
17 a little sketch showing where the water is going. And
18 even when I sort of gave it to the Commission,
19 GSI-191, we made a little sketch for them.

20 CHAIRMAN RAY: Yes.

21 MEMBER BANERJEE: It's always nice to have
22 that to remind us why this is an issue that's very
23 briefly --

24 CHAIRMAN RAY: Yes. Well, I thought the
25 SER did a pretty good job of bringing a reader to that

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1 understanding. And so that's fine. We ought to get
2 them in on the first day of the full Committee
3 meeting. And we ought to have a separate two hours on
4 GSI-191 and on the amendment.

5 And, Eileen, I don't know what you guys --

6 MEMBER BANERJEE: I don't think we need
7 two hours. One hour is sufficient, more than
8 sufficient.

9 CHAIRMAN RAY: Whatever you say. One
10 hour.

11 MEMBER BANERJEE: All right.

12 CHAIRMAN RAY: Then I'll take three ours
13 on the amendment, whatever.

14 MEMBER BANERJEE: All right. All right.

15 CHAIRMAN RAY: But we're going to have to
16 really -- because of what we're trying to get done
17 here, we're really going to have to cut short staff,
18 what I call routine staff, summary statements. I
19 mean, it's going to be a real tough job when it gets
20 to the amendment of trying to adequately inform the
21 full Committee in the limited time we have available
22 to then write a letter.

23 MS. McKENNA: That was why we put this on
24 the agenda today, was we really want to understand
25 what items you particularly wanted us to cover for the

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1 full Committee and not spend a lot of time given
2 history and the --

3 CHAIRMAN RAY: Yes. I know that's right.

4 MS. McKENNA: -- so many chapters and so
5 many open items and things like that but really hit
6 some of the big topics, like obviously the shield
7 building is one and then maybe a couple of others you
8 would like to suggest. We have ideas, but we really
9 want to --

10 CHAIRMAN RAY: Well, give me any ideas you
11 have right now that are on the top of your head.

12 MS. McKENNA: A couple of the changes in
13 the chapter 23; containment vacuum relief, for
14 example, we thought might be worthy of discussion. I
15 think the air vents may come in through the discussion
16 of the shield building. You know, I think those are
17 some of the more major topics.

18 CHAIRMAN RAY: Does the full Committee get
19 an AIA discussion, SDI presentation on AIA, or not? I
20 realize that's after December, but I am asking a
21 question.

22 MS. McKENNA: At this point there is
23 nothing planned that way, but --

24 CHAIRMAN RAY: Okay.

25 MS. McKENNA: -- it is certainly something

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1 that --

2 MEMBER SHACK: Write a letter and --

3 MS. McKENNA: Yes.

4 CHAIRMAN RAY: We'll have to have a
5 separate discussion of that. Okay. And I thought
6 that what Lee presented and what Westinghouse did that
7 we saw this time was very responsive and helpful.

8 MEMBER SHACK: One of the big issues is
9 always I&C.

10 CHAIRMAN RAY: Yes.

11 MEMBER SHACK: I don't know how that's
12 fruitfully discussed in the whole Committee, but --

13 CHAIRMAN RAY: Okay. Let's agree on that.
14 I&C and shield building.

15 MS. McKENNA: Okay.

16 CHAIRMAN RAY: Dennis, in your area
17 anything other than I&C that -- I'm just searching
18 right now for topics that the full Committee needs a
19 briefing on related to the amendment.

20 MEMBER BLEY: Not that I'm thinking of
21 right now.

22 CHAIRMAN RAY: No significant changes in
23 PRA or --

24 MEMBER BLEY: We need to go back. I'll go
25 back through my notes and double-check.

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1 CHAIRMAN RAY: Yes, Charlie?

2 MEMBER BROWN: I would think some
3 discussion, I would think the I&C discussion,
4 hopefully could be somewhat summarized fairly crisply
5 relative to the four pillars.

6 CHAIRMAN RAY: Well, everything needs to
7 be crisp.

8 MEMBER BROWN: I'm just saying if they
9 focus it on those area because the rest of the detail
10 has been pretty much gone through by the staff. And
11 those are the areas we have been struggling with in
12 terms of independence to determine it. So if they
13 give a brief discussion that they have satisfied that
14 and there are actions in place, I think that putting
15 down the next point, that's I&C. Okay?

16 This is also kind of I&C. The DAS issue I
17 think we ought to at least emphasize the point that
18 this is a two out of two system, number one, so
19 everybody is totally cognizant of that, understand the
20 fallout of that relative to one of the channels out of
21 service.

22 You don't have anything DAS-wise. There
23 are two aspects to the DAS. One is automatic. One is
24 manual. There are four automatic DAS functions.
25 There are 11 manual DAS functions. The four

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1 automatics are also encompassed under the manual. And
2 so you can accomplish those four manually as well.

3 Right now the way the tech specs are
4 written or the investment protection, whichever they
5 might have a -- both of those could be out of service
6 for 14 days. That's based on the paperwork that
7 somebody asked for some clarification and one of the
8 I&C guys gave that to --

9 CHAIRMAN RAY: Has this changed?

10 MEMBER BROWN: I don't know. Let me
11 finish.

12 CHAIRMAN RAY: Well, but --

13 MEMBER BROWN: Right now you could have
14 both out of service simultaneously.

15 CHAIRMAN RAY: Yes. But I'm asking, has
16 that changed as a result of the amendment?

17 MEMBER BROWN: I don't know. It's just if
18 I have all DAS, both manual and auto, out of service,
19 that's probably not --

20 MR. CUMMINS: It has not changed.

21 CHAIRMAN RAY: Okay. The problem I'm
22 having, Charlie, is I can't let things that aren't
23 changed by the amendment take up time unless we think
24 it's at the point where we have to raise it as an
25 issue that we want to go back and revisit the existing

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1 certification. We just can't do that.

2 MEMBER BROWN: I understand that point.
3 You know, it was all done before my watch. So --

4 CHAIRMAN RAY: That's right. So we'll
5 exonerate you from it. But the point is --

6 MEMBER BROWN: I will not feel exonerated
7 -- okay? -- walking away from it. Now, that's my
8 fundamental problem. Okay?

9 CHAIRMAN RAY: All right. Well, then I
10 would suggest that you make that point clear in the
11 Committee discussion.

12 MEMBER BROWN: Absolutely. I'm not
13 questioning that.

14 CHAIRMAN RAY: But I'm not going to take
15 time presenting something that hasn't been changed by
16 the amendment without a very good reason.

17 MEMBER BROWN: Harold?

18 CHAIRMAN RAY: Yes?

19 MEMBER BROWN: If I had nothing else to
20 draw on, I understand that that has not changed. But
21 still the articulation of having both manual DAS and
22 auto DAS out of service simultaneously does not sound
23 like a prudent method of operation regardless. I
24 don't care whether it was approved before or not --

25 CHAIRMAN RAY: I understand.

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1 MEMBER BROWN: -- because it probably
2 wasn't addressed in that context. It was probably
3 only addressed as one or the other.

4 CHAIRMAN RAY: And if there is something
5 that you can identify that says, "Well, we now know
6 something that we didn't know when we certified it
7 before," anything, but I can't get into --

8 MEMBER BROWN: I will ask the staff to
9 tell me if they considered that.

10 CHAIRMAN RAY: I don't know if that's the
11 --

12 MEMBER BLEY: This came up through the
13 connection of the PRA, too. And I will double-check
14 back to make sure that the requirements stayed the
15 same and the modeling was the same.

16 MEMBER BROWN: No. The PRA discussion
17 under the DAS, under the architecture does not -- it
18 talks about the PRA being used to give credit to
19 these, but it does not specify the details.

20 CHAIRMAN RAY: Well, I've said what I've
21 said, which is I'm just not going to take full
22 Committee time to review something that hasn't been
23 changed by the amendment as a general matter. I mean,
24 there could be some circumstance where it simply was
25 so critical that we had to do that, but this doesn't

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1 do that.

2 Yes, Sam?

3 MEMBER ARMIJO: Yes. When is the full
4 Committee going to hear about the pump and the
5 flywheel issue?

6 CHAIRMAN RAY: Okay. I think that's a
7 fair point, absolutely. The pump has been changed.
8 The design of the pump --

9 MEMBER ARMIJO: The flywheel has been
10 changed.

11 CHAIRMAN RAY: The flywheel has been
12 changed. So put that on your list, Ed. We're going
13 to have to have a discussion about the pump because a)
14 we have to establish that it isn't a safety issue
15 because you have to first do that before Sam then can
16 say, well, he differs.

17 MEMBER ARMIJO: I disagree.

18 CHAIRMAN RAY: Yes.

19 MR. CUMMINS: Okay. We'll be ready for
20 the pump.

21 CHAIRMAN RAY: All right. Anything else
22 now? Really, I'm really trying to --

23 MEMBER BROWN: No because --

24 CHAIRMAN RAY: I appreciate your input,
25 Charlie. I'm just telling you that's the way I have

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1 to --

2 MEMBER BONACA: I have a question.

3 CHAIRMAN RAY: -- rule on anything.

4 Yes, Mario?

5 MEMBER BONACA: Regarding the Committee, I
6 mean, how knowledgeable are they on this amendment?
7 Because, I mean, that is important for you. You have
8 so many items here that we have covered. And to some
9 degree you have got to document them at some point.
10 And maybe this could be a high-level presentation.

11 And what are you saying? This is the
12 amendment. And that is high cascades into some
13 groupings if you can present in a slide, for example.

14 CHAIRMAN RAY: Yes, we can do that. Maybe
15 that's a good thing to do. I've already asked
16 Westinghouse how they would describe this amendment in
17 terms of what is it. It's an enormous number of
18 things. You can call it design finalization. You can
19 come up with some label to put on it. Okay?

20 But, in reality, it is a lot of things
21 that naturally arise at this stage of a complex
22 reactor development like this is. So it's something
23 that should be anticipated. It doesn't indicate
24 anything other than it's we're at a different stage
25 than we were when the rev. 15 was certified.

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1 So that we don't get into some controversy
2 about what name we give the amendment or what we say
3 it is, I asked them to tell me what you think I should
4 say it is to start with.

5 But you're making another suggestion,
6 which I think is related. And that is, well, okay.
7 You give it a name. You call it design finalization
8 or something like that, whatever you decide you're
9 going to call it. How about trying to put it into
10 categories that are affected by the change? Well, the
11 shield building is an easy one.

12 MEMBER BONACA: Right.

13 CHAIRMAN RAY: I&C is another one. People
14 expect that to change with time. Everybody knows
15 that. Vendor selection affecting things like the
16 reactor coolant pump is another one. So let me invite
17 Westinghouse if they wish to do so to suggest some
18 ways that I can bucket this thing, that I can then
19 communicate it to the membership in a way that doesn't
20 unfairly or inaccurately characterize what the
21 amendment represents.

22 MEMBER ARMIJO: Harold, I think you should
23 get input from the staff as well that they don't have
24 a different view of what the amendment is.

25 CHAIRMAN RAY: Right. But, rather than

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1 get two things and try and marry them up, I was going
2 to see what Westinghouse suggested to me. And then I
3 was going to say, "Do you guys agree with this?"

4 MEMBER ARMIJO: This is what we thought we
5 were asking for and confirm it.

6 CHAIRMAN RAY: Yes. You know, --

7 MR. CUMMINS: So do you want a
8 presentation we could make?

9 CHAIRMAN RAY: Well, certainly you are
10 welcome to do that.

11 MR. CUMMINS: To the full Committee maybe
12 for an hour or a short time.

13 CHAIRMAN RAY: Yes, a short time.

14 MR. CUMMINS: Yes.

15 CHAIRMAN RAY: But something that would
16 allow us to say, "Yes. That is a fair
17 characterization of this thing." And, like I say,
18 there is nothing about it -- I don't want to
19 characterize it in a way that mislabels it and
20 something you would be uncomfortable with unless I
21 just disagree with what you say.

22 MR. CUMMINS: So maybe we'll draft a
23 presentation in the near term and send it to you.

24 CHAIRMAN RAY: All right.

25 MR. CUMMINS: And then you can see what

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1 you think.

2 CHAIRMAN RAY: And I'll ask the staff for
3 their input, see if they have a different view. Like
4 I say, there are some things to carve out easily, like
5 AIA affects the shield building. Okay. We've got the
6 shield building. Put that over here. There's lots
7 and lots of other stuff. We worked like hell on this
8 thing.

9 MEMBER BONACA: That's a good point. What
10 I mean is that otherwise for the record, all the
11 Committee here is three or four items.

12 CHAIRMAN RAY: Yes.

13 MEMBER BONACA: And then they remain with
14 the question of what it is. I think if you put it
15 together in an organized fashion, then there is a
16 logic for people to listen to -- you didn't have to
17 say how you developed an issue. You think people are
18 going to say this issue has been reviewed and closed.

19 But there was this issue that we have talked about,
20 so something like that.

21 CHAIRMAN RAY: Okay. Well, it is a chore
22 that we need to do. They certainly, the full
23 Committee, has heard me whine about this enough that
24 they know that it's something peculiar or unusual.
25 And I'm just finding a way to be able to, as Mario

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1 said, characterize it overall and not misrepresent
2 what we're dealing with.

3 MEMBER SHACK: How much time do you have
4 at the full Committee?

5 CHAIRMAN RAY: I can't tell you. I was
6 asking -- there's Tanny. He can tell us.

7 MR. SANTOS: At the December full
8 Committee meeting, I've got three hours assigned on
9 the first day. But it's all afternoon. The only
10 thing after that is letter writing. So if you need a
11 little more time, it's just going to cut into the
12 letter writing for that day.

13 MEMBER SHACK: I mean, Charlie has got a
14 note here saying, "How can we do this in four hours?"
15 And I kind of have to agree with him. I mean, six
16 hours might be closer to reality.

17 CHAIRMAN RAY: Yes.

18 MEMBER ARMIJO: I think it's a one-day
19 meeting.

20 CHAIRMAN RAY: I provided input more than
21 once, saying that it bothered me that we had anything
22 going on at the full Committee other than this. So
23 let me just -- you hear what people are saying, Tanny.
24 I mean, I think we'd better give more time than just
25 three hours plus going into the night.

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1 MR. SANTOS: Well, start 1:00 o'clock on
2 the Thursday and then until Said wants to adjourn that
3 night. I mean --

4 CHAIRMAN RAY: Okay. Let me just --

5 MEMBER SHACK: What's in the morning?

6 MR. SANTOS: The license renewal and the
7 rule on emergency planning.

8 MEMBER SHACK: Can we move those to the
9 next day?

10 MR. SANTOS: No. The next already has a
11 safety culture and RAMONA.

12 CHAIRMAN RAY: Well, here. Let me just do
13 it this way. Could you take a message back from this
14 Subcommittee -- and if there is anybody on the
15 Subcommittee who disagrees say so -- that the
16 Subcommittee feels we need more time than three hours
17 plus going into the evening? Okay? Just tell them
18 that and --

19 MEMBER BANERJEE: And some of that stuff,
20 like RAMONA, can be put off for another meeting.

21 PARTICIPANT: Safety culture is one.

22 CHAIRMAN RAY: Tell them, listen, I have
23 made the point we should count on a January meeting.
24 If there are things that are absolutely critical, have
25 got to be done, then tell them the chances are that it

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1 is going to have to be this, I mean, part of this, not
2 all of it, or it's one of those things.

3 I mean, people with more experience here
4 than me say three hours ain't going to do it, four
5 hours won't do it either.

6 MEMBER BANERJEE: No way.

7 CHAIRMAN RAY: Okay.

8 MEMBER BANERJEE: It's a major
9 certification. I mean, amendment or certification,
10 come on. We are serious.

11 CHAIRMAN RAY: Yes.

12 MEMBER SHACK: I hate to bring up another
13 thing, Harold. Do we want to deal with the
14 non-concurrence at the full Committee?

15 MEMBER BANERJEE: Yes.

16 CHAIRMAN RAY: Okay. I'm glad you --

17 MEMBER BANERJEE: I think we need a full
18 day.

19 CHAIRMAN RAY: All right. But the problem
20 is I've said that before and I haven't prevailed.

21 MEMBER BROWN: Well, we'll support you.

22 CHAIRMAN RAY: All right. Good.

23 MEMBER BANERJEE: And we are vociferous.

24 (Laughter.)

25 CHAIRMAN RAY: Be vociferous. Send

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1 e-mails to the Staff Director and so on. Okay. The
2 non-concurrence. That's a good point. It, of course,
3 fits into the shield building discussion.

4 And, thinking about it, I think, Bill, it
5 has to fall to you to characterize because we have
6 talked about it and I know you understand it. I'm
7 talking about Boze's position. The question in my
8 mind, then, is, given that, do you think Westinghouse
9 should make a pitch?

10 I don't think we should ask Westinghouse
11 to respond to the position. I don't think we can do
12 that. We've got to say we looked at the
13 non-concurrence and came to some conclusion. But now,
14 having said that, you've been Chairman before. Tell
15 me what you think we should do.

16 MEMBER SHACK: Well, I haven't dealt with
17 a non-concurrence on a certification before. So I
18 think somehow it seems to me that we have to have that
19 presented to the full Committee.

20 CHAIRMAN RAY: You're the most expert
21 person able to do it.

22 MEMBER SHACK: You want to then depend on
23 you and I getting our views and Boze's views or we
24 want to have Westinghouse make a presentation. But,
25 again, we're running out of time.

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1 CHAIRMAN RAY: Let me just say --

2 MR. CUMMINS: Maybe we could make
3 something like we did just the other day, the summary
4 --

5 MEMBER SHACK: That would be much closer
6 to what we would want.

7 MR. CUMMINS: Yes.

8 MEMBER SHACK: You know, the second
9 presentation we had for half an hour, I think.

10 MR. CUMMINS: Yes.

11 MEMBER SHACK: If we gave the
12 non-concurrence a half-hour and Westinghouse a
13 half-hour, we're out an hour already.

14 CHAIRMAN RAY: Wait a minute. This is --
15 I don't think we want to go there, frankly, but let's
16 think about it offline. I don't think we want the
17 applicant to be in a position of even just based on
18 the proximity of the presentations appearing to
19 respond to the non-concurrence.

20 Non-concurrence has gotten a response.
21 The responses by the staff to the non-concurrence, I
22 think it's right that we need to mention that we have
23 reviewed it, but I don't want to have a debate along
24 those lines in front of the Committee. I just don't
25 think --

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1 MEMBER ARMIJO: I agree with you, Harold.
2 I think otherwise we would get at least an hour on
3 that issue. And I think in your opening remarks, that
4 issue should be included so that everything has been
5 brought to us and presented to us and we'll be making
6 our -- and we made our conclusion as a Subcommittee, I
7 think. I don't know, but --

8 CHAIRMAN RAY: The only response I believe
9 that can be discussed as the non-concurrence is the
10 response that has already been made in the staff
11 response. That's it.

12 MEMBER BLEY: However, when Westinghouse
13 presents their story on the shield building, I don't
14 see why some of that material that was presented the
15 second day wouldn't be in there. It's very
16 appropriate.

17 CHAIRMAN RAY: Yes, that's right, but not
18 from the standpoint of --

19 MEMBER BLEY: Just as part of this shield
20 building discussion.

21 CHAIRMAN RAY: That's fair enough.

22 MR. KRESS: Just a point on this. We had
23 some non-concurrences when I was Chairman. And the
24 reason they come to the ACRS with them is that is the
25 only place they have to go to get an unbiased review.

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1 You've got the staff on one side and the
2 non-concurrence on the other side and may involve the
3 vendor but maybe not.

4 And I think the ACRS has to come to some
5 conclusion on it. It has to give their opinion. And
6 it has to be in writing, in a letter.

7 Now, I don't know. You know, I don't know
8 how to do that.

9 CHAIRMAN RAY: Yes, but in this case, Tom,
10 I think -- let me just put this to you and see what
11 you say. In this case, I think we're prepared to do
12 that without having a debate in front of the Committee
13 between the applicant and the staff member.

14 MR. KRESS: Yes. I don't think you need
15 that either. Yes. I think you can discuss it among
16 yourselves.

17 CHAIRMAN RAY: Yes. I agree. We've got
18 to address it. That's why I agree with Bill on that
19 point.

20 MR. KRESS: I think you do need the person
21 who made the non-compliance issue to come and address
22 the full Committee, though, --

23 CHAIRMAN RAY: Okay.

24 MR. KRESS: -- because he's entitled to
25 that.

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1 CHAIRMAN RAY: Tanny, would you check and
2 see if Ed is okay with that?

3 MR. SANTOS: Okay.

4 CHAIRMAN RAY: All right. But I not want
5 to get into a "Okay. We've heard the non-concurrence.
6 Now let's hear what Westinghouse has to say."

7 MEMBER BROWN: No, but you can hear what
8 the staff has to say.

9 CHAIRMAN RAY: We can, but I don't know
10 that that is a good use of our time.

11 MEMBER SHACK: Well, no. I don't know
12 that either one of them is in any sense responding to
13 the non-concurrence. I mean, the staff has to present
14 to us why they think the shield building design is
15 acceptable.

16 CHAIRMAN RAY: Right.

17 MEMBER SHACK: I don't think it's
18 unreasonable for Westinghouse to tell us why they did
19 the shield building the way they did.

20 CHAIRMAN RAY: All right. And we can hear
21 the non-concurrence.

22 MEMBER SHACK: Then we can hear the
23 non-concurrence.

24 CHAIRMAN RAY: That's right.

25 MEMBER SHACK: That would be roughly the

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1 way I would do it.

2 CHAIRMAN RAY: Right. It's not a debate.

3 MEMBER BONACA: That issue can take the
4 day away.

5 MEMBER BROWN: I mean, that's the problem.
6 It's the problem.

7 MEMBER BONACA: You have to be really firm
8 and say, "Let's move on."

9 MEMBER ARMIJO: You're never going to
10 finish in an hour on that.

11 MEMBER BONACA: This issue could take
12 hours. I can think of some members who love to talk
13 about the issue.

14 MEMBER BROWN: How can you not?

15 MEMBER SHACK: Maybe it has to take --

16 CHAIRMAN RAY: As far as I am concerned,
17 Bill and I could go to the full Committee and say, "We
18 have listened to the non-concurrence. We have gotten
19 our consultant to review it. We have reviewed the
20 staff response to the non-concurrence. And this is
21 our conclusion." I think we can do that.

22 MEMBER BANERJEE: I think the guy needs a
23 chance to address the Committee.

24 CHAIRMAN RAY: All right. That's
25 consistent with what you are saying, right?

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1 MEMBER SHACK: Since we are an open public
2 forum, as a FACA committee, you know, this is a fairly
3 unusual circumstance. I think you just need to have
4 it on the record, full Committee.

5 MEMBER ARMIJO: And we can't have
6 everything. We can't do all that stuff in one day.

7 MEMBER BANERJEE: I mean, there's a lot of
8 stuff we do which is not that high priority. We can
9 put it off to later, do it another time, do it in the
10 January meeting. I don't think we have to -- we
11 should make enough time to --

12 CHAIRMAN RAY: All right. Where you guys
13 are taking this is it seems to me we have to choose,
14 then, between 191 and the amendment to do in December.
15 Maybe we can do part of the amendment in 191, but it
16 sure as heck is clear that we are not going to do both
17 of them in three hours.

18 MEMBER BANERJEE: What are we doing in
19 December which is higher priority than this?

20 CHAIRMAN RAY: I tried to say nothing, but
21 I didn't prevail.

22 MEMBER ARMIJO: We have a Federal Register
23 notice.

24 MR. SANTOS: We added the January full
25 Committee meeting knowing that if it wasn't complete

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1 in December, it was going to be --

2 CHAIRMAN RAY: It is complete, Tanny. We
3 can't get it before the full Committee in three hours
4 or four hours. That's the problem. It isn't that it
5 isn't complete.

6 MR. SANTOS: That's why we added January.
7 We needed more full Committee time. I thought that's
8 why we added January.

9 MEMBER ARMIJO: That was the --

10 CHAIRMAN RAY: But the January date I
11 believe we need to separate two things. Are we not
12 ready in December or do we not have enough time in
13 December?

14 Now, for me the January date was because
15 we thought we might not be ready in December. And
16 that could still be true. But if we are ready in
17 December, then the question is, do we have enough time
18 in December given that we are ready in December?

19 MR. SANTOS: Right. But we always planned
20 on having these other topics at the December meeting.
21 And, you know --

22 CHAIRMAN RAY: Without doubt.

23 MR. SANTOS: -- all the other topics that
24 --

25 CHAIRMAN RAY: Okay. The Federal Register

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1 notice is out?

2 MR. SANTOS: It's out.

3 CHAIRMAN RAY: Then that's it. We're off
4 until January for at least part of this. There's no
5 way in the world that we can get it done in three
6 hours.

7 MEMBER ARMIJO: You can get GSI-191 done,
8 clean, one clean big issue.

9 CHAIRMAN RAY: But I think it --

10 MEMBER SHACK: Do we want to take the
11 whole day and just not make the --

12 MEMBER BANERJEE: Or you can have the
13 amendments --

14 MEMBER SHACK: -- letters until January?
15 We'll come back and write the letters in January.

16 CHAIRMAN RAY: Meaning what -- I mean,
17 you're talking about just extending the afternoon
18 meeting?

19 MEMBER SHACK: Yes.

20 CHAIRMAN RAY: Well, that's not going to
21 be enough according to what you guys are all telling
22 me.

23 MEMBER BROWN: Including time --

24 MEMBER SHACK: Two days. I mean, we have
25 all afternoon on the first day. What is scheduled on

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1 the second day?

2 MR. SANTOS: A couple of more briefings in
3 the morning. And the afternoon is just the P&P and
4 letter writing, that kind of stuff.

5 MEMBER BLEY: Can you move it to another
6 day without a Federal Register notice, then?

7 MEMBER BANERJEE: They can't move
8 anything.

9 MEMBER SHACK: You can make a change.

10 MEMBER BLEY: Yes.

11 CHAIRMAN RAY: We're not moving a session,
12 as I understand it. It would be that we just don't
13 allow time to write. We do lots of stuff, but we
14 wouldn't get the letter written is the problem.

15 MEMBER SHACK: Although I think I like
16 your arrangement better, where we just pick one of the
17 -- you know, we either pick the license amendment or
18 GSI-191 and we come back in January for the rest.

19 CHAIRMAN RAY: Well --

20 MR. CUMMINS: So just a comment.

21 CHAIRMAN RAY: Yes?

22 MR. CUMMINS: This affects the rulemaking
23 schedule. And you can be sure that there will be lots
24 of phone calls.

25 CHAIRMAN RAY: Yes.

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1 MS. MCKENNA: Yes. I mean, I think it's
2 true that --

3 MR. CUMMINS: I mean, if we're ready and
4 we're not able to do it, there will be phone calls
5 from everybody.

6 MS. MCKENNA: We need both --

7 CHAIRMAN RAY: I appreciate the input, but
8 I didn't have any doubt about that.

9 (Laughter.)

10 CHAIRMAN RAY: Wait, wait. Let's listen
11 to Eileen.

12 MS. MCKENNA: What I was saying, I think
13 the point is that in order to move forward with the
14 rulemaking, we need both letters because the GSI is
15 part of the scope of the amendment. So we can't put
16 that off.

17 CHAIRMAN RAY: Yes. I mean, but you can
18 put it off and just not complete the rulemaking until
19 January.

20 MS. MCKENNA: But that is the schedule
21 question --

22 CHAIRMAN RAY: All right. Listen --

23 MS. MCKENNA: -- that was brought up that
24 we're going to have to --

25 CHAIRMAN RAY: Do you have anything to

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1 suggest given that there is a Federal Register notice
2 out that says that we're going to do this all in three
3 hours?

4 MEMBER ARMIJO: No. I think we would look
5 bad.

6 MEMBER SHACK: I think we can redo the
7 Federal Register notice. I mean, if it comes to that
8 --

9 MEMBER BANERJEE: I don't see why we need
10 to deal with RAMONA, why we can't put that off or
11 safety culture.

12 CHAIRMAN RAY: Okay. But it requires a
13 change, Sanjoy. That's all. The problem is --

14 MEMBER BANERJEE: Change it, then.

15 CHAIRMAN RAY: All right.

16 MEMBER BANERJEE: Change it.

17 CHAIRMAN RAY: They couldn't tell when
18 they issued the FRN that we would be ready. We
19 couldn't tell until we went through these three days
20 that we thought we would be ready.

21 MEMBER BANERJEE: No. We didn't know.

22 CHAIRMAN RAY: That's right.

23 MEMBER BANERJEE: So we have to be
24 flexible. Now we know. So we change the FRN. That's
25 it.

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1 CHAIRMAN RAY: Tanny, do you want to say
2 something?

3 MR. SANTOS: Briefings on those other
4 topics but then defer those letters for those other
5 topics to another one?

6 MEMBER ARMIJO: No. No. We need the
7 time. We need the time, Tanny. We can't work 24
8 hours a day.

9 CHAIRMAN RAY: You're looking at --

10 MEMBER ARMIJO: No.

11 CHAIRMAN RAY: -- more than me here.

12 MEMBER ARMIJO: There are some license
13 renewals on there.

14 MR. SANTOS: Yes.

15 MEMBER BANERJEE: No. License renewal is
16 a different thing.

17 MR. SANTOS: It would hold up certain
18 phone calls.

19 MEMBER BANERJEE: Leaving aside, why do we
20 need to hear about safety culture and RAMONA?

21 MEMBER BLEY: Well, I can tell you about
22 the safety culture, but we could cut it back probably
23 to an hour because there is an SRM out requiring the
24 staff respond to the Commission with the new policy
25 statement on safety culture. So they have to get a

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1 letter off, and we have to have reviewed it. I think
2 we could get by with an hour on that.

3 MR. SANTOS: It was scheduled for an hour
4 and a half. So that just buys you --

5 MEMBER BLEY: That only buys a half an
6 hour.

7 MEMBER BANERJEE: And do we have to write
8 a letter?

9 MEMBER BLEY: We have to, yes.

10 MEMBER SHACK: Well, are have tos and have
11 tos.

12 MEMBER ARMIJO: There are going to be
13 impossible lists of have tos.

14 CHAIRMAN RAY: All right. I'm telling you
15 --

16 MR. KRESS: Why don't you add another day
17 to the meeting at the front end.

18 CHAIRMAN RAY: Well, that's the first of
19 December. That's when we were going to do --

20 PARTICIPANT: That's a Subcommittee
21 meeting.

22 MEMBER BONACA: We can't because it's
23 already --

24 MR. SANTOS: Unless you want to have the
25 Sunday. That's the only day we could add.

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1 MEMBER BANERJEE: I'm not going to be
2 here. I'm going to be in Norway.

3 CHAIRMAN RAY: You're not going to be
4 here, in Norway, on Thursday and Friday?

5 MEMBER BANERJEE: No.

6 CHAIRMAN RAY: And I hope you're not going
7 to be there on Wednesday.

8 MEMBER BANERJEE: No.

9 CHAIRMAN RAY: All right.

10 MEMBER BANERJEE: Wednesday, Thursday, and
11 Friday I am here.

12 CHAIRMAN RAY: Well, I guess we have done
13 all we can do here. Look, we have, we and the
14 applicants and the staff have, all worked very hard to
15 get to the point where at least we have a shot at, no
16 guarantees, a shot at, writing a letter on the
17 amendment and on 191. And everybody saying three
18 hours, four hours, five hours isn't going to be
19 enough.

20 MR. DIAS: Here's a question. Do you need
21 hours in the briefings or the full Committee or do you
22 need hours to actually be able to write a letter?

23 CHAIRMAN RAY: Both.

24 MR. DIAS: Both.

25 CHAIRMAN RAY: Both but --

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1 MS. McKENNA: Basically the whole --

2 CHAIRMAN RAY: Right now it's the briefing
3 that everybody thinks is going to be --

4 MR. DIAS: You can only have three hours
5 for the briefing.

6 CHAIRMAN RAY: Yes. And everybody is
7 saying you need a day, Antonio.

8 MR. DIAS: Before the full Committee, wow.
9 Okay.

10 CHAIRMAN RAY: But I said that several
11 times. It's going to take a whole meeting to go
12 through this.

13 MEMBER BANERJEE: There's a concurrence
14 issue, right?

15 CHAIRMAN RAY: Yes. You could say the
16 non-concurrence was the reason it would add at least a
17 couple of hours by the time all the handering is done.

18 MR. SANTOS: Thursday AP1000 and move the
19 other two items to Friday for just briefings?

20 CHAIRMAN RAY: That would be an
21 improvement, I think. Don't you guys think?

22 MEMBER SHACK: Oh, yes, that would be a
23 big improvement, I think. I mean, that's doable.

24 CHAIRMAN RAY: I mean, if we could take
25 all day Thursday and then let the chips fall where

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1 they may on Friday, I mean, I would be happy. Sanjoy
2 would be happy. And we would have a shot at it. So
3 go see if you can do that, would you, then, please?

4 MEMBER SHACK: The letter on RAMONA I
5 think we would put off.

6 MR. DIAS: That's what I was thinking. We
7 could move that --

8 MEMBER SHACK: To January.

9 MR. DIAS: -- possibly to January.

10 MEMBER SHACK: But you're saying we can't
11 do that with the safety culture.

12 MEMBER BLEY: I'm not sure of the exact
13 date on safety culture.

14 MR. DIAS: But I will check that.

15 MEMBER BLEY: I think that would be an
16 easy letter.

17 MR. DIAS: Right now we can do it, safety
18 culture. I'm going to check if we can move it to
19 January. Okay.

20 MEMBER BONACA: Can we switch the meeting
21 to Saturday afternoon late?

22 MR. DIAS: The meeting, right now the
23 agenda ends at 3:30 on Saturday already because we
24 have quite a few letters. That's the problem.

25 MEMBER BROWN: We only have amendment,

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1 GSI-191, and KIWANI. That's three letters, isn't it?

2 MEMBER ARMIJO: And there's emergency
3 preparedness. There have been Subcommittee. Jack is
4 ready with a letter on that.

5 CHAIRMAN RAY: Yes, but something has got
6 to give.

7 MEMBER ARMIJO: I know. It's impossible.

8 CHAIRMAN RAY: Well, but that could give
9 without any disastrous consequences, right?

10 MEMBER ARMIJO: You know, all of this has
11 got to be addressed at one time.

12 MEMBER SHACK: The staff I think has to --
13 you know, that is an NRC decision on their priorities
14 here. You know, the --

15 CHAIRMAN RAY: Yes. Let them have these
16 phone calls that Ed is referring to and tell us what
17 the answer is.

18 MR. CUMMINS: We'll be happy to call
19 anybody.

20 (Laughter.)

21 9. CLOSING REMARKS

22 CHAIRMAN RAY: All right. Enough said.
23 We're going to bring this to an end here now. I guess
24 what I would say is I've cut the record on this
25 because we are saying that we think with one more day,

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1 Subcommittee day, on December 1st, that it's likely we
2 would have the issues resolved that would enable us to
3 write a letter, but we need a full day to present all
4 of the information to the full Committee.

5 Right now there isn't a full day allowed.

6 There is only an afternoon. And, therefore, we have
7 made a request to take a full day on Thursday. We
8 will have to see if that can be done. And everybody
9 will be so advised.

10 And anybody who thinks they can help make
11 that decision the right way, they're free to do
12 whatever they think they can do. Okay?

13 Anything else that we need to talk about?

14 It's a quarter to 5:00.

15 MEMBER BANERJEE: Just one question.

16 CHAIRMAN RAY: Yes?

17 MEMBER BANERJEE: We are going to shoot to
18 do if we find enough time both letters.

19 CHAIRMAN RAY: Yes.

20 MEMBER BANERJEE: So we should prepare for
21 both in that case.

22 MEMBER BROWN: It sounds like we have to.
23 They go hand in hand.

24 CHAIRMAN RAY: That's right.

25 MEMBER BANERJEE: So that means that we

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1 have to draft the letters in advance.

2 CHAIRMAN RAY: That's why I gave you what
3 I had been working on for 191 a few minutes ago. And
4 Weidong and I are going to have to work through
5 Thanksgiving week to try and draft the amendment
6 letter.

7 Weidong, you're not taking the week off,
8 are you?

9 MR. WANG: Not a week. I can work overtime.

10 CHAIRMAN RAY: And I'd ask for input from
11 these guys over here. Okay?

12 MR. WANG: Yes.

13 CHAIRMAN RAY: All right. Anything else?
14 We'll keep you informed of the outcome on this, but
15 at least right now we have made a request that the
16 full Committee have the entire day Thursday.

17 MEMBER SHACK: I think I'll go make some
18 changes in my airplane reservations.

19 MEMBER BLEY: Saturday.

20 MEMBER SHACK: No. Like Sunday.

21 MEMBER BLEY: Sunday I meant, the Saturday
22 reservations to Sunday.

23 CHAIRMAN RAY: With that, we are adjourned.

24 (Whereupon, the foregoing matter was
25 concluded at 4:47 p.m.)

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Presentation to the ACRS Subcommittee

Westinghouse AP1000 Design Certification Amendment Application Review

**SER Chapter 23
Design Changes Proposed In Accordance With
Interim Staff Guidance 11**

November 19, 2010

Chapter 23 Review Team

Technical Staff

- **John Budzynski**, Technical Reviewer, SRSB/DSRA
- **Hien Le**, Technical Reviewer, CTSB/DCIP
- **Michelle Hayes**, Technical Reviewer, SPCV/DSRA

Project Manager

- **Brian Anderson**, Project Manager, NWE1/DNRL

Chapter 23 Overview

- Not previously issued as an SER with open items.
- Evaluates most of the proposed design changes that were submitted subsequent to DCD, Revision 17 and that satisfy one or more of the criteria of Interim Staff Guidance 11 (ISG-11).
- ISG-11, in part, describes categories of design changes that should not be deferred until after the issuance of the design certification rule.
- Categories of those changes include:
 - correction of significant errors
 - changes to ensure compliance with NRC regulations
 - changes to support other licensing-basis documents
 - significant technical corrections associated with the design
 - changes needed to address significant vulnerabilities identified by probabilistic risk assessments or other studies

Section 23.L – Changes to Passive Core Cooling System Injection Lines

- Proposed design changes address gas intrusion concerns
- Design changes include:
 - Addition of manual vent valves and manual drain valves
 - Addition of pipe stubs and remote gas void indications
 - Re-routing of accumulator discharge line connections
 - Revision of Technical Specifications 3.5.6, 3.5.7, and 3.5.8 for controls of operations of the IRWST in operating Modes 1- 4 and shutdown Modes 5 and 6

Section 23.L – Changes to Passive Core Cooling System Injection Lines

Component	Number Added	Location
manual maintenance vent valves	8	6 passive injection and recirculation line piping high point locations
pipe stubs	4	<ul style="list-style-type: none"> -line routing to tee into CMT vent line routing to the RCDT -outlets of each of the IRWST passive injection squib valves
manual maintenance drain valves	20	<ul style="list-style-type: none"> -14 PXS passive injection and recirculation piping locations -5 RNS piping locations -1 RCS piping location <p>Note: RNS & RCS not related to gas intrusion</p>

Section 23.L – Changes to Passive Core Cooling System Injection Lines

The staff's evaluation of these proposed design changes assessed:

- Proposed placement of high point vents and low point drains
 - P&IDs against pipe routing isometrics
- Identify gas intrusion mechanisms
 - Valve leakage & accumulator leakage (nitrogen blanket)
- Surveillance and venting procedures
 - Technical Specifications
 - Operations procedures
- Component acceptance criteria
 - GDC 2 & GDC 4
- ITAAC & Startup Testing not affected by the changes

Section 23.L – Changes to Passive Core Cooling System Injection Lines

- **Conclusions**

- AP1000 design, testing, and NRC staff historical confirmatory testing demonstrated passive safety systems are not susceptible to any adverse effects from gas intrusion:
 - Would not significantly degrade safety system performance
 - Would not adversely impact plant safety following design basis events
- AP1000 passive safety systems are not susceptible to the pump-related mechanisms:
 - Gas binding of suction piping
 - Destructive water hammer from rapid fluid flow changes once a pump is started

Section 23.S – Changes to the Passive Containment Cooling System

- The revised shield building increased resistance in the Passive Containment Cooling System natural circulation air flow path, resulting in the following DCD changes:
 - Lower required reactor decay heat limit for air only cooling
 - Increase spent fuel pool thermal capacity
 - Reduce minimum post-72 hour PCCWST flow rate supply to containment when plant is being refueled
- Design changes include revisions to Technical Specifications 3.3.2-1, 3.3.5-1, 3.6.7, and 3.7.9 to reflect the revised requirement for the minimum calculated reactor decay heat at Modes 5 and 6 as a result of the reduction of air flow through the Shield Building annulus

Section 23.S – Changes to the Passive Containment Cooling System

- Applicant evaluated impact of changes on qualification testing with a new Air Flow Characterization Test
- Applicant revised WGOTHIC models to demonstrate:
 - Negligible impact to design basis LOCA and Main Steam Line Break events
 - Containment pressure remains below design value for seven days with air only cooling if reactor decay heat is at or below 6 MWt
 - For beyond design basis accident event of a loss of offsite power concurrent with loss of PCS water, containment pressure remains below maximum pressure capability for 24 hours
 - Containment pressure remains well below design value for seven days following loss of power event concurrent with start of refueling when post-72 hour PCCWST flow rate supply to containment is 80 gpm

Section 23.S – Changes to the Passive Containment Cooling System

- The staff's evaluation of these proposed design changes included:
 - Audits of Westinghouse calculations
 - Confirmatory analyses using CONTAIN
 - Double-ended cold leg LOCA
 - Air Only Cooling with 6 MWt decay heat
 - Beyond Design Basis Accident 24 hour air only cooling
 - 80 gpm water flow during refueling Design Basis Accident

Section 23.S – Changes to the Passive Containment Cooling System

- **Conclusions**
 - Proposed changes are compliant with:
 - GDC 16, 38, 50
 - 10 CFR 50.47(c)(2) as it relates to design certification testing in support of a passive plant design



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**SER Chapter 23
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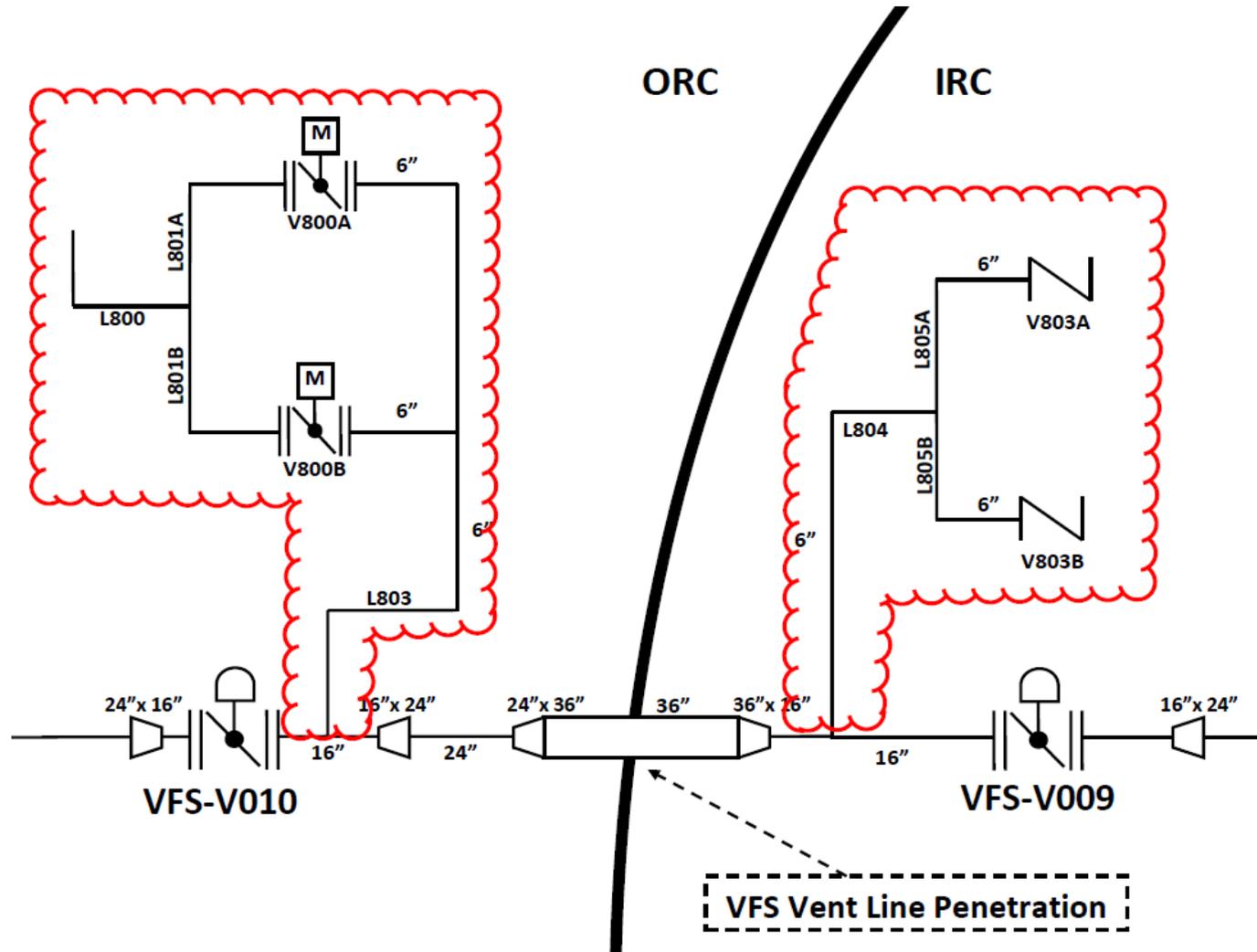
Project Manager

- **Brian Anderson**, Project Manager, NWE1/DNRL

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- Proposed design changes
 - Add a vacuum relief system to the containment to prevent external differential pressure between containment and the shield building from exceeding the design value
 - Reduce external pressure design limit from 2.9 psid to 1.7 psid
 - Add Technical Specification 3.6.10, Vacuum Relief Valves, to provide assurance these components will adequately perform their functions.

Section 23.W – Changes to Add a Vacuum Relief System to the Containment



Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- The staff's assessment of the proposed design changes included:
 - System Design and Analyses
 - Containment Isolation and Leak Rate Testing
 - Valve Design, Qualification, and Testing
 - Instrumentation and Control
 - Technical Specifications

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- System Design and Analyses
 - Westinghouse revised WGOTHIC model to incorporate vacuum relief system and remove non-mechanistic assumptions
 - Westinghouse analyses:
 - Demonstrated vacuum relief system maintains containment pressure within design value
 - Confirmed limiting event remains Loss of AC on cold day
 - Staff's evaluation included
 - Review of assumptions, methodology, and supporting calculations
 - Confirmatory calculations with CONTAIN model
- Staff concludes that analyses comply with GDC 16
 - Most severe transient was analyzed
 - Analysis was done in a conservative manner

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- Containment Isolation and Leak Rate Testing
 - Vacuum relief design has two flow paths which connect directly with the containment atmosphere and penetrate the primary containment
 - This design complies with the requirements of GDC 56 by providing each vacuum relief device with a check valve inside containment and a motor operated butterfly valve outside containment
 - This design complies with the 10 CFR 50.34(f)(2)(xiv)(B) redundancy requirement. If a check valve failed to close during an accident, the MOV in series with it would close on a “T” signal, thereby providing containment isolation

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- Containment Isolation and Leak Rate Testing
 - On the basis of its review of the containment isolation design of the proposed vacuum relief design, the staff concludes that the design complies with the acceptance criteria in Section 6.2.4 of the SRP, including 10 CFR 50.34(f)(2)(xiv), “Additional TMI-Related Requirements,” and the CSB BTP 6-4, “Containment Purging During Normal Plant Operations”
 - On the basis of its review the staff concludes that the proposed addition of the vacuum relief valves to the already certified AP1000 containment leakage rate testing program complies with the acceptance criteria of Section 6.2.6 of the SRP

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- Valve Design, Qualification, and Testing
 - Butterfly Valves VFS-PL-V800A/B
 - 6-inch butterfly valve with offset disc
 - Motor-operated from separate Class 1E battery source
 - Capacity coefficient and stroke time for full flow capacity
 - Will be qualified in accordance with ASME QME-1-2007 per RG 1.100 (Rev. 3)
 - Check Valves VFS-PL-V803A/B
 - 6-inch horizontally installed check valve with swing disc
 - Open at preset differential air pressure
 - Valve flow capacity
 - Will satisfy ASME BPV Code, Section III, Subsection NC-7000 for vacuum relief valves

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- Valve Design, Qualification, and Testing
 - ITAAC
 - AP1000 DCD Tier 1, Section 2.2.1, “Containment System,” will be revised to include butterfly valves VFS-PL-V800A/B and check valves VFS-PL-V803A/B
 - Table 2.2.1-3 specifies ITAAC for the containment system, and will be revised to specify butterfly valve closing time
 - Table 2.7.6-2 for the containment air filtration system will include new ITAAC for butterfly valve opening time
 - Conclusions
 - Design and qualification for butterfly valves VFS-PL-V800A/B and check valves VFS-PL-V803A/B meet ASME BPV Code and ASME QME-1-2007 per RG 1.100 (Rev. 3)
 - Valve IST activities meet 10 CFR 50.55a and ASME OM Code

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- Instrumentation and Control
 - Functional logic added to Protection and Safety Monitoring System to automatically control the two new vacuum relief MOVs
 - Manual control function and status indication in main control room also added for the two new vacuum relief MOVs
 - The staff concludes that the proposed changes comply with relevant requirements in GDC 13, 19, 20, and 21

Section 23.W – Changes to Add a Vacuum Relief System to the Containment

- Technical Specifications
 - Addition of a Low-2 containment pressure trip function to TS Table 3.3.2-1 for opening of the motor-operated vacuum relief valves
 - Addition of TS 3.6.10 for controls of the Vacuum Relief System
 - Revision to TS 3.6.4 and TS 3.6.5 in support of the new TS 3.6.10 requirements
 - On the basis of its review, the staff concludes that technical specifications are adequately addressed

Section 23.V – Changes to the Component Cooling Water System

- Proposed design changes to CCS piping arrangement and isolation signals to prevent a tube rupture in the RCP cooling water heat exchanger from overpressurizing CCS outside of containment
- Design changes include:
 - Modification of CCS piping
 - Modification of containment isolation valve closure logic
 - Addition of Technical Specification 3.3.2 ESFAS instrumentation function to provide CCS isolation inside containment in the event of a heat exchanger tube leak
 - Modification of RCP heat exchanger outlet isolation valve closure logic

Section 23.V – Changes to the Component Cooling Water System

- Modifications to CCS piping
 - Addition of two 4-inch x 6-inch ASME safety-class relief valve (CCS-PL-V270 and CCS-PL-V271) on the 10-inch CCS supply and return lines, respectively; just inside the innermost containment isolation valves
 - Changed the pipe safety class between the innermost containment isolation valves and the Appendix J test valves (CCS-PL-V214 and CCS-PL-V216) from Class '0' to Class 'C' to ensure that the relief valves are installed as ASME safety-class piping

Section 23.V – Changes to the Component Cooling Water System

- Modification to the closure logic for CCS motor-operated containment isolation valves CCS-PL-V200, CCS-PL-V207, and CCS-PL-V208
 - Additional closure on generation of the RCP bearing water high temperature pump trip signal
 - Addition of an RCP bearing water temperature high signal for closure of CCS containment isolation valves to Technical Specifications Table 3.3.2-1
 - Derived from a 2 out of 4 of the four divisions of high RCP bearing water temperature for any reactor coolant pump
 - Additional closure logic implemented in the protection and safety monitoring system

Section 23.V – Changes to the Component Cooling Water System

- Modification to CCS RCP Heat Exchanger outlet isolation valves (CCS-PL-V256A/B/C/D)
 - Removal of automatic closure logic (based on high delta of inlet to outlet flow) from the nonsafety-related plant control system, but manual control from main control room is retained
 - High delta flow between the inlet and outlet lines would generate a flow deviation alarm to alert plant operators
 - New alarm indicates RCS leak conditions; upon which operators would close the valve on the cooling water outlet line on each RCP
 - Flow signals and outlet isolation valves are nonsafety-related

Section 23.V – Changes to the Component Cooling Water System

- Conclusions
 - CCS piping system is adequately protected from over-pressurization due to a postulated RCP external heat exchanger tube rupture
 - Two ASME Section III Class 3 relief valves
 - Both relief valves would see the overpressurization event
 - Limits CCS to ~200 psig
 - Containment isolation valves close on sensed RCP high bearing water temperature
 - Staff RELAP analyses confirm containment isolation valve closure within AP1000 piping classification of 300 F/230 psig (JCB & JCC)
 - Containment isolation valve closure occurs within a few minutes with RCS near 200 F

Section 23.V – Changes to the Component Cooling Water System

- Conclusions
 - During a postulated RCP external heat exchanger tube rupture, the proposed design meets all applicable NRC regulations
 - Will not adversely affect safety related SSCs
 - CCS will still perform defense in depth and RTNSS functions
 - Technical Specifications are adequately addressed
 - Provides new containment isolation signal
 - Maintains containment integrity
 - Prevents Inter System LOCA

Acronyms

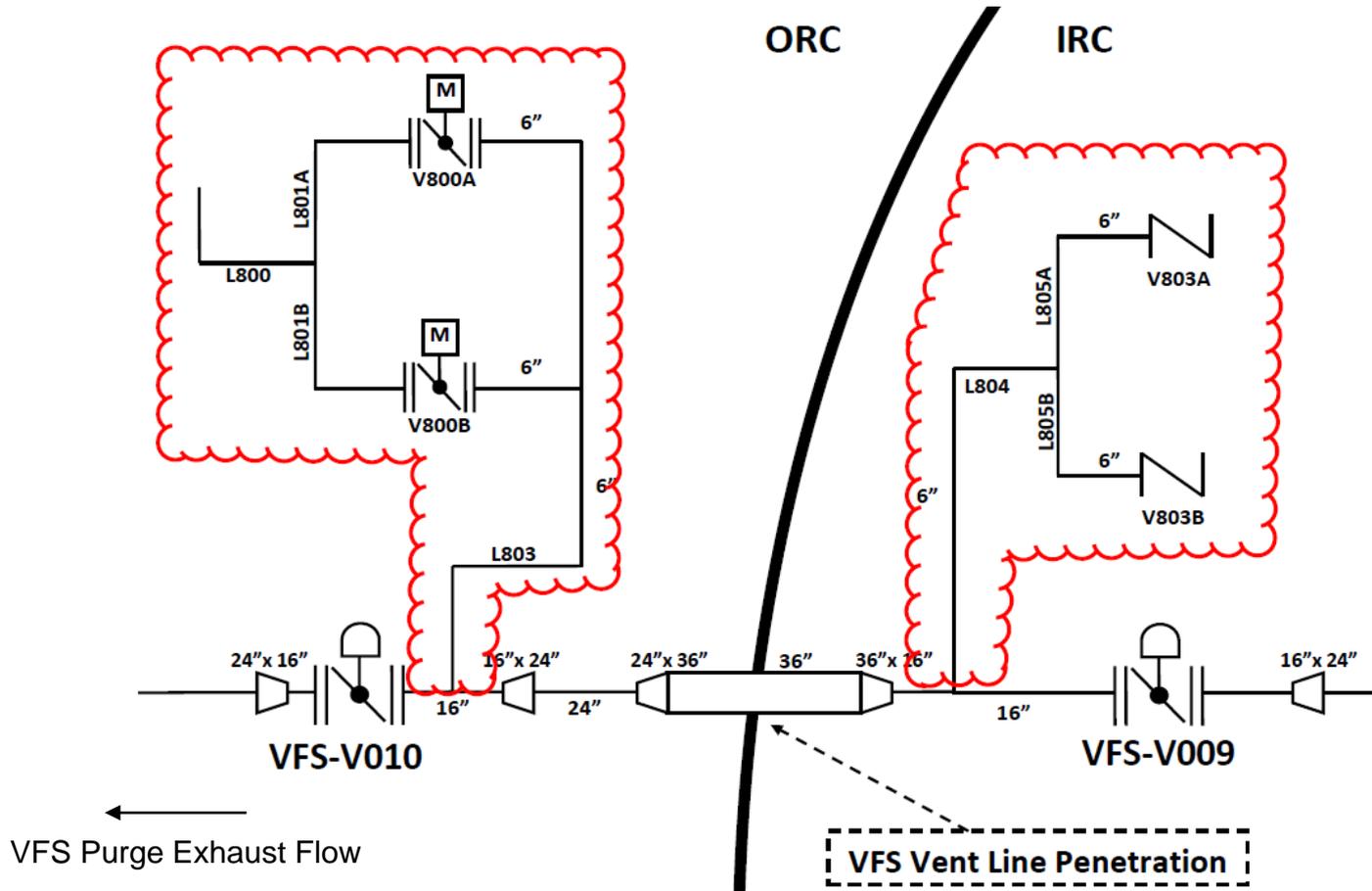
- CCS - Component Cooling Water System
- CMT - Core Makeup Tank
- ESFAS - Engineering Safety Feature Actuation System
- IRWST - In-containment Refueling Water Storage Tank
- PCCWST - Passive Containment Cooling Water Storage Tank
- PXS - Passive Core Cooling System
- RCDT - Reactor Coolant Drain Tank
- RCS - Reactor Coolant System
- RNS - Normal Residual Heat Removal System
- RTNSS - Regulatory Treatment of Non Safety Systems
- VFS - Containment Air Filtration System

ACRS Meeting
AFSE 23.W – CN 74
AP1000 Containment Vacuum Relief System

November 2010

Chuck Brockhoff Nuclear Systems Design
Gary Sedlacek HVAC Systems Design Lead

Vacuum Relief Piping Arrangement



Addition of a Vacuum Relief System

- A containment overcooling event was identified which required the addition of a safety-related containment vacuum relief system
- Added redundant safety-related 6-inch vacuum relief valves that share a flow path through the existing VFS containment purge exhaust penetration
 - Satisfies ASME Code Section III Division 1 NE-7152 (Vacuum Relief Devices)
 - Added new Tech Spec 3.6.10 (similar to NUREG-1431 Tech Spec 3.6.12)
 - Added 2 MOV butterfly valves outside Containment and 2 check valves inside containment (active valves require in-service testing per DCD 3.9.6)
 - Automatically open MOVs from Class 1E batteries on low containment pressure (safeguards actuation requirements added to Tech Spec 3.3.2)
 - Vacuum relief actuation has priority over containment isolation
 - DBA is a cold front that overcools containment (trip / loss of ac limiting)
 - The CV design external pressure is determined to be -1.7 psig (Service Level A/D)
 - Valve arrangement similar to current plants [CE 2-loop/ W 2-loop]
- Evaluated Transient Analyses / System Design / ASME Code / CV shell design