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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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US-APWR SUBCOMMITTEE

+ + + + +

TUESDAY

SEPTEMBER 17, 2013

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ROCKVILLE, MARYLAND

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

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COMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman

SANJOY BANERJEE, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

JOY REMPE, Member

MICHAEL T. RYAN, Member

STEPHEN P. SCHULTZ, Member

DESIGNATED FEDERAL OFFICIAL:

GIRIJA SHUKLA

TABLE OF CONTENTS

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

Opening Remarks and Objectives, John Stetkar, 3

ACRS 4

Staff Introductions, William Ward, NRO

Discussion of the US-APWR DCD Chapter 6, "Engineered Safety Features" 12

Discussion of the Staff SE for the US-APWR DCD Chapter 6 149

Discussion of the Comanche Peak, COLA Chapter 6

Discussion of the SE for the Comanche Peak, COLA Chapter 6

Subcommittee Discussion

Adjourn

ACRS

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

8:30 a.m.

CHAIRMAN STETKAR: The meeting will now come to order. This is a meeting of the United States Advanced Pressurized Water Reactor Subcommittee. I am John Stetkar, chairman of the subcommittee meeting.

ACRS members either in attendance or to be here are Sanjoy Banerjee, Dennis Bley, Steve Schultz, Mike Ryan, Charlie Brown, and Joy Rempe.

Mr. Girja Shukla, the ACRS staff is the Designated Federal Official for this meeting.

The Subcommittee will discuss the US-APWR design certification document and Comanche Peak combined license application; Chapter 6, Engineered Safety Features; topic report, MUAP-07001, the Advanced Accumulator; and the staff's Safety Evaluation Reports associated with these documents.

We will hear presentations from Mitsubishi Heavy Industries, Mitsubishi Nuclear Energy Systems, Luminant Generation Company, and the NRC staff.

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

The rules for participation in today's

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1 meeting have been announced as part of the notice of  
2 this meeting previously published in the Federal  
3 Register.

4           Parts of this meeting may need to be closed  
5 to the public to protect information proprietary to  
6 Mitsubishi Heavy Industries or MNES or other parties.

7       I'm asking the NRC staff and the Applicant to identify  
8 the need for closing the meeting before we enter into  
9 such discussions and to verify that only people with  
10 the required clearance and need to know are present.

11       So again, just keep track of the discussion. If we  
12 veer into proprietary information either ask us to hold  
13 a question or we'll accumulate things at the appropriate  
14 time and close the meeting. So I'll ask you to keep  
15 track of that because I'm not very sensitive to those  
16 things.

17           A transcript of the meeting is being kept  
18 and it will be made available as stated in the Federal  
19 Register notice. Therefore, we request that  
20 participants in this meeting use the microphones located  
21 throughout the meeting room when addressing the  
22 Subcommittee. The participants should first identify  
23 themselves and speak with sufficient clarity and volume  
24 so that they may be readily heard. A telephone bridge  
25 line has also been established for this meeting. To

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1 preclude interruption of the meeting, the phone will  
2 be placed on the listen in mode during the presentations  
3 and committee discussions.

4 Please silence your cell phones or whatever  
5 else makes noise and we will now proceed with the  
6 meeting. I've heard that we now have a new project  
7 manager and so I'll ask the NRC staff, Perry Buckberg  
8 to open the meeting.

9 MR. BUCKBERG: Thanks, John. My name is  
10 Perry Buckberg. I took over as the lead for the DCD  
11 last Monday night of September and I'll give a little  
12 background of the status of the project as I know it.

13 Thirteen chapters have been through the full Committee,  
14 the Subcommittee and then full Committee at this point.

15 Chapter 6 and most design centers usually has some  
16 complicated issues and it's usually one of the later  
17 chapters to be issued and for the ACRS to discuss and  
18 that's where we are this morning.

19 Just a general summary, I guess, and any  
20 specific discussions about Chapter 6 I'll turn it over  
21 to Chapter 6 PM Ruth Reyes and we appreciate the  
22 opportunity to brief ACRS this morning.

23 CHAIRMAN STETKAR: Thanks, Perry.

24 Ruth, do you have anything to say? That  
25 was quite. With that, Ryan?

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1 MR. SPRENGEL: Good morning, everyone,  
2 this is Ryan Sprengel with MNES. Good to see everyone  
3 again. It's been a little break, but I think we have  
4 a busy close out to the year.

5 CHAIRMAN STETKAR: We'll be seeing a lot  
6 of each other in the next two or three months.

7 MR. SPRENGEL: As usually, we'll provide  
8 any follow ups following the meeting if we're not able  
9 to provide responses during the meeting. I think we  
10 work well with the ACRS members on those follow-up items  
11 and with that brief introduction, I'll go and turn it  
12 over to Rebecca Steinman to start the presentation.

13 CHAIRMAN STETKAR: One of the things that  
14 I did want to mention, I think we're all aware that we  
15 have a meeting scheduled on October 1st, in particular  
16 for the GSI-191 related issues for long-term cooling.

17 So what I'd like to do in this meeting and GSI-191  
18 strainer blockage, downstream effects, are all related  
19 to Chapter 6, but if it's possible we can delve into  
20 some of those issues, in particular debris accumulation,  
21 strainer blockage, downstream effects to some extent  
22 in this meeting, but I'd like to reserve a lot of the  
23 detailed discussion of those topics for the October 1st  
24 meeting if at all possible.

25 So this is just a forewarning, if I see the

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1 discussion getting into too much detail about strainer  
2 testing or debris accumulation, either on the sump  
3 strainers themselves or the downstream effects, I'm  
4 going to try to hold that level of discussion down and  
5 postpone it for October 1st a little bit.

6 MR. SPRENGEL: We definitely agree with  
7 you.

8 CHAIRMAN STETKAR: Excellent. I'm glad  
9 we're on the same page. That was just a forewarning.

10 I don't want to quell discussion too much, but I do  
11 want to avoid unnecessary repetition of information and  
12 I want to make sure that on October 1st we have a complete  
13 picture, essentially, of the debris transport from  
14 wherever it's generated all the way to whatever makes  
15 it to the field.

16 MS. REYES: John, this is Ruth Reyes,  
17 Chapter PM. For the same reason in our previous dry  
18 runs in meetings to prepare for this meeting, we make  
19 sure that in the NRC staff presentation there's nothing  
20 related to GSI-191.

21 CHAIRMAN STETKAR: Good.

22 MS. REYES: And in MHI --if there's  
23 something, it will be very minimal.

24 CHAIRMAN STETKAR: Out of curiosity, just  
25 so I organize my thoughts and perhaps understand a little

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1 bit how to control the meeting, is MHI and the staff  
2 going to discuss net positive suction head issues in  
3 this meeting?

4 MS. STEINMAN: Our intent is to provide  
5 that information in the October meeting.

6 CHAIRMAN STETKAR: In the October meeting.

7 MS. STEINMAN: If it's necessary to discuss  
8 it today, we have prepared backup materials for that  
9 purpose, but it is not part of the main presentation.

10 CHAIRMAN STETKAR: That's fine, we need to  
11 discuss at some point --

12 MS. STEINMAN: Our intention is to do that  
13 in October.

14 CHAIRMAN STETKAR: It's different, but  
15 related to the debris transport issue, so we'll also  
16 try to table the detailed discussions on net positive  
17 suction head, containment accident pressure, and those  
18 types of issues for the October meeting. Good, thank  
19 you. That helps.

20 MEMBER BANERJEE: Just, just a point for  
21 clarification. Will we discuss long-term cooling at  
22 the October 1st meeting or what's the intention of it?  
23 Is it just GSI-191? There are issues associated with  
24 long-term cooling.

25 CHAIRMAN STETKAR: Yes, I think, Sanjoy,

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1 we'll have a full day with just GSI-191, especially if  
2 we include the pump suction head issue, so I think that  
3 aspect of long-term cooling will try to cover all of  
4 those issues in the October meeting. Other concerns,  
5 I know that you have, are probably more relevant to bring  
6 up in this meeting.

7 MEMBER BANERJEE: The thing about boron --

8 CHAIRMAN STETKAR: It's difficult because  
9 of the pervasive nature of the issue of long-term cooling  
10 and all of the different factors that fold into it.  
11 There's thermohydraulic analyses, there's LOCA  
12 analyses, there's issues of debris, many, many different  
13 issues. And --

14 MS. REYES: It's my understanding there  
15 were some topics related to long-term cooling in Chapter  
16 15 that were already discussed at the Chapter 15 ACRS  
17 meeting.

18 CHAIRMAN STETKAR: That's I think --

19 MS. REYES: If there's something that the  
20 staff wants to hear again, please let us know and we  
21 can incorporate that into our presentation.

22 CHAIRMAN STETKAR: Okay, let's do it that  
23 way. Raise the questions, anything that's not related  
24 -- it sounds like the staff and MHI are planning to cover  
25 NPSH containment accident pressure and all things

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1 related to debris transport, strainer plugging  
2 downstream effects in that meeting in October. If there  
3 are other issues that --

4 MEMBER BANERJEE: Bring it up at the end  
5 of this meeting.

6 CHAIRMAN STETKAR: Bring it up at the end  
7 of this meeting so we sort of alert people to it.

8 MEMBER BANERJEE: Because I think I have  
9 certain concerns which we brought up in Chapter 15.

10 CHAIRMAN STETKAR: That's right, there are  
11 Chapter 15-related concerns, so you're right.

12 MEMBER BANERJEE: One of them dealt with  
13 the long-term cooling --

14 MS. REYES: I know that in our presentation  
15 we are going to be including bottom precipitation which  
16 is Chapter 15 on this long-term cooling. So that will  
17 on October 1st.

18 CHAIRMAN STETKAR: Let's just see how it  
19 goes. I'm just trying to figure out so we don't miss  
20 anything between the two meetings and we don't have too  
21 much duplicative discussion of specific issues,  
22 especially as you all know, we tend to get into details.

23 All right, well, with that, thanks Rebecca.

24 MS. STEINMAN: Thank you very much. Good  
25 morning. This presentation is for the DCD Chapter 6

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1 which covers the engineered safety features for the  
2 USA-PWR design.

3 Next slide, please.

4 My name Rebecca Steinman and I am the  
5 licensing engineer responsible for Chapter 6 and I will  
6 be the lead presenter this morning. However, I have  
7 brought excellent technical support with me to aid in  
8 answering your questions. This support includes  
9 Takafumi Ogino, Naohiko Seto, Mark Biery, Hiroshi  
10 Hamamoto and, of course, Ryan Sprengl, who you have met  
11 already.

12 Next slide, please.

13 The next several slides in today's  
14 presentation are just a list of acronyms. I don't  
15 intend to spend any time on these, but they are provided  
16 for your reference during the presentation.

17 Mark, if you could be so kind as to fast  
18 forward past those, it would be appreciated.

19 Here we see an overview of the six main  
20 sections of the DCD. In Section 6.0, we have an overview  
21 of the engineered safety features. In 6.1, we have the  
22 material specifications associated with the ESFs. 6.2  
23 covers the containment systems. 6.3 covers the  
24 emergency core cooling systems. 6.4, the habitability  
25 systems. 6.5, fission product removal and control

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1 systems. And 6.6, the ISI Class 2 and Class 3  
2 components.

3 The remainder of this presentation will  
4 discuss each of these sections individually and point  
5 out those features of the US-APWR that are essentially  
6 the same as other operating plants, as well as features  
7 that are unique to the US-APWR design. At the end of  
8 each section, I will summarize the open items remaining  
9 under the review area and briefly outline the intended  
10 closure path of each item from MHI's perspective.

11 As a brief side note, for GSI-191, you are  
12 aware that we are having another meeting and as a result,  
13 the open items that are related to that topic are not  
14 going to be discussed in today's presentation. They're  
15 briefly listed as to what the topic is, but that's the  
16 only level of detail that we were intending to provide  
17 today and the detailed discussion would be provided on  
18 October 1st.

19 CHAIRMAN STETKAR: And again, I'll ask if  
20 you think because some of the topics are interrelated,  
21 if you think we're getting into a line of questioning  
22 that delves more toward what you're planning to cover  
23 in October, just alert us to that. We'll tick off a  
24 box and save the question for that.

25 Before you flip the slide over, I had a

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1 question and just for my understanding, we, the ACRS  
2 Subcommittee, currently have Revision 3 of the DCD.  
3 We also have various revisions of a number of supporting  
4 technical reports. I understand that some features of  
5 the plant design have changed since DCD Revision 3 was  
6 issued that affect some of the long-term cooling issues  
7 and basic water flows and some configurations inside  
8 the containment, RWSP, and so forth.

9 If I look at the technical reports, for  
10 example, MUAP-08001, that report seems to be written,  
11 at least the version that we have to the what I'll call  
12 perhaps dangerously the current design or as DCD  
13 Revision 3 seems to be written to the old design.

14 What information are you going to present  
15 today?

16 MS. STEINMAN: The staff's SE was written  
17 against DCD Rev. 3.

18 CHAIRMAN STETKAR: That's not clear  
19 either. I was going to ask the staff after I ask you.

20 (Laughter.)

21 MS. STEINMAN: It is written against that.  
22 There have been several RAIs that incorporate various  
23 changes to the DCD. We recently submitted DCD Rev. 4  
24 to the staff, but it was very recent and not in time  
25 to be processed in preparation for this meeting. The

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1 primary changes that you're talking about are in DCD  
2 Rev. 4 and they are going to be the focus of much of  
3 our GSI-191 presentation on October 1st so that that  
4 design change is predominantly going to be discussed  
5 as part of that meeting and the materials that are going  
6 to be described today as part of the Chapter 6  
7 presentation are items that had I would say minimal  
8 changes related to them as a result of the RAI process  
9 and review process between Rev. 3 and Rev. 4 of the DCD.

10 So in terms of the redesign of the flow path  
11 for the recirculating water and things along those  
12 lines, that is primarily going to be focused on as part  
13 of the GSI-191 presentation next month.

14 MEMBER BANERJEE: So the --

15 CHAIRMAN STETKAR: I have a bit of a  
16 problem, hold on a second, Sanjoy?

17 MEMBER BANERJEE: Yes.

18 CHAIRMAN STETKAR: I have a bit of a problem  
19 because it is now by my watch September 17th and the  
20 meeting is October 1st. That's, I believe, something  
21 on the order of two and a half weeks or something like  
22 that. We normally like to receive information about  
23 30 days in advance of our meetings because we're kind  
24 of busy people and we're kind of only half-time people.

25

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1           So we don't have time to process Rev. 4 of  
2 the DCD in the next two weeks.

3           MS. REYES: Yes. We didn't have Rev. 4 30  
4 days before this meeting, but I have provided the latest  
5 revision of the technical reports related to GSI-181.

6           CHAIRMAN STETKAR: Right, we do have those.  
7 We received those whenever it was, a couple of weeks  
8 ago. So those were in place for 30 days. So I guess  
9 we'll organize our discussions around those technical  
10 reports because I know they do include the latest design.

11          MS. STEINMAN: The technical reports were  
12 revised in June of this year and they do reflect the  
13 latest design. And if you have access to the tracking  
14 reports that we provide for the DCD, those incorporate  
15 that information into the DCD, but it kind of requires  
16 a little bit of looking at multiple documents.

17          CHAIRMAN STETKAR: Rebecca, if you saw the  
18 thousands of pages, literally thousands of pages of  
19 material that we each receive each week, we don't want  
20 more.

21                   (Laughter.)

22          MS. STEINMAN: I don't blame you there.  
23 I completely understand.

24          MEMBER BLEY: That said, do get us Rev. 4s.

25          CHAIRMAN STETKAR: As soon as we can get

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1 it.

2 MEMBER BANERJEE: So just for  
3 clarification, the flow path discussion in the SE, staff  
4 SE, refers to Rev. 3 or is it Rev. 4?

5 MS. REYES: The SE was written based on Rev.  
6 3. Rev. 4 was like two weeks ago I think it was  
7 submitted, so I will like if it's possible that the staff  
8 -- has not been submitted yet because we still have to  
9 do the proper dissemination of the DCDs. Staff doesn't  
10 even have these Rev. 4 of the DCD yet.

11 MEMBER BANERJEE: So whatever discussion  
12 on flow paths there is in your SE refers to Rev. 3?

13 MS. REYES: That is GSI-191 and for  
14 GSI-191, I have provided the latest reports which have  
15 incorporated the changes.

16 MR. SPRENGEL: Can we clarify that the  
17 staff's SE is written on Rev. 3 and are our responses  
18 and committed changes?

19 CHAIRMAN STETKAR: That was my --

20 MR. SPRENGEL: The SER is actually written  
21 to what we would call the current design.

22 CHAIRMAN STETKAR: That was my  
23 understanding because as I read through the SER, it  
24 seemed to describe flow-path configurations that are  
25 consistent with, for example, the information in Rev.

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1 -- hold on a second, 7 of MUAP-08001 which is the current  
2 design. Now whether that was elicited through RAIs,  
3 I'm not sure, but --

4 MR. SPRENGEL: Which it was.

5 CHAIRMAN STETKAR: But for example, both  
6 the flow-path configuration for the recirculating  
7 water, the configuration of the sodium pentaborate,  
8 sodium tetra -- whatever the heck, NETB drain lines and  
9 things like that. The current configuration seems to  
10 be reflected in the version of the SER that we have,  
11 not the old configuration.

12 I'm just curious because I have questions  
13 about trying to orient myself to what we are reviewing  
14 and commenting on versus what the staff SER addresses  
15 versus what we may hear about today versus what we may  
16 hear about in two weeks. And again, I don't want to  
17 miss things that might be pertinent, and I don't want  
18 to discuss the same issue twice.

19 MS. REYES: As Ryan was explaining, on the  
20 SEs, it's based on Rev. 3, but it also incorporates  
21 responses from the staff's RAI. So like this change,  
22 this specific change in the RWSB flow path was -- these  
23 changes and the FP because it's based on our RAI  
24 response.

25 CHAIRMAN STETKAR: Okay.

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1                   MEMBER BANERJEE: For example, things like  
2 ineffective volume and so on are reflected in your SER,  
3 is the correct values that you're using, the revised  
4 values?

5                   CHAIRMAN STETKAR: The current values. I  
6 believe that's true. But the reason I ask is because  
7 I had some questions about volumes and hold-up volumes  
8 and RWSP volumes and things like that, based on my  
9 understanding of the current design.

10                  MR. BUCKBERG: If I may, another approach  
11 to this is that the SER is written to DCD Rev. 3 and  
12 the design, if I may, evolves from that point on through  
13 RAI responses and technical reports. Whatever is  
14 referenced in the SER, those RAI responses and technical  
15 reports is what the SE is based on and what the subject  
16 of this meeting should be.

17                  DCD Rev. 4, when it's through processing  
18 at the NRC at the Document Control Desk, will capture  
19 perhaps most of those technical reports and RAI  
20 responses and incorporate those changes into the  
21 document, but we're in a point in between right now and  
22 that SE captures a certain point in time and that's the  
23 subject of the discussion today.

24                  CHAIRMAN STETKAR: I'm just trying to pin  
25 down what the point and time is because as I read the

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1 SE, the SE also seems to be between. Although it says  
2 Rev. 3 there are words and numerical values and  
3 conclusions in the version of the SE that we have. It  
4 seemed to be derived from that later information.

5 MR. BUCKBERG: Later information that  
6 should be in a letter that's referenced by date in the  
7 SE I would think, RAI responses.

8 CHAIRMAN STETKAR: RAI responses.

9 MR. BUCKBERG: Right, right.

10 CHAIRMAN STETKAR: Anyway, let's play it  
11 by ear. I'm going to ask my questions, for example,  
12 based on my understanding of the current design. Be  
13 a little bit careful because the October 1st meeting  
14 is one day and we have a lot of material to cover in  
15 that one day. I don't want to necessarily postpone too  
16 many things to say we'll discuss them on October 1st  
17 unless we all bring mattresses because I don't want to  
18 go until midnight that day.

19 Let's do that. I think that helps a little

20 --

21 MEMBER BANERJEE: If we get too stuck with  
22 volumes and flow paths and stuff on October 1st, we're  
23 never going to get down to the real thing.

24 CHAIRMAN STETKAR: That's exactly right.

25 I mean --

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1 MEMBER BANERJEE: We'll try to cover as  
2 much as we can today.

3 CHAIRMAN STETKAR: Right.

4 MEMBER BANERJEE: Or tomorrow.

5 CHAIRMAN STETKAR: Right. And you know,  
6 for reference, this is our first meeting on these topics.

7 We will have another chance to revisit DCD Chapter 6  
8 during -- I always forget the phases, 4, 5, whatever  
9 it is of our review when the final SER is written. We  
10 have that opportunity to tie up loose ends, but I want  
11 to make sure that if we do have any particular concerns  
12 at this point in time we have the opportunity to discuss  
13 those concerns with both MHI and the staff.

14 MEMBER BANERJEE: So when is Rev. 4 going  
15 to be available?

16 CHAIRMAN STETKAR: Tomorrow. We're going  
17 to get it tomorrow.

18 MR. BUCKBERG: It's being processed and  
19 docketed right now. It's a huge document with many  
20 different files and it's just taking some time to do.

21 We have to wait. It's not on our website or available  
22 to the public or to the staff just yet because it's just  
23 taking time. It could be tomorrow.

24 CHAIRMAN STETKAR: Could we get it by the  
25 end of the week?

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1 MR. BUCKBERG: Seems reasonable, I would  
2 think, but I'm not sure. Some of these things take ten  
3 days or so to process.

4 CHAIRMAN STETKAR: You get the notion that  
5 haste is important because we would really like to avoid  
6 this type of discussion on October 1st, if at all  
7 possible.

8 MR. BUCKBERG: Understood.

9 CHAIRMAN STETKAR: Okay, let's continue  
10 because we'll be here until midnight tonight if I don't  
11 let you folks address what you plan to address.

12 MS. STEINMAN: The first section of DCD  
13 Chapter 6 provides an overview of the four main ESF  
14 systems for the US-APWR. These include the containment  
15 system which involves heat removal, isolation, and  
16 hydrogen monitoring and control systems; the ECCS which  
17 covers the accumulate, the high-head injection, and the  
18 emergency letdown; the habitability systems which cover  
19 systems such as the main control or main check system;  
20 and the fission product removal and control systems.

21 The design information associated with  
22 these ESFs is discussed in greater detail in subsequent  
23 sections of the DCD and as a result, no RAIs were issued  
24 for this overview level section of the DCD.

25 Next slide, please.

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1           This slide provides an outline of DCD  
2 Section 6.1 which provides information on the material  
3 section and fabrication of the ESF systems. In addition  
4 to other important attributes, the materials used in  
5 the ESF systems are selected for compatibility with the  
6 refueling water storage pit water as well as the spray  
7 conditions that result from the combination of the  
8 refueling water storage pit fluid with sodium  
9 tetraborate decahydrate in the event of a design basis  
10 accident.

11           Let's go ahead and begin with an overview  
12 of the metallic material specifications. The US-APWR  
13 components are designed and manufactured in accordance  
14 with the ASME Boiler and Pressure Vessel Code 2001  
15 edition for 2003 addenda. The material specifications  
16 for the pressure retaining materials in the ESF systems  
17 are the same as those used for the reactor coolant  
18 boundary piping and valves as specified in DCD Section  
19 5.3.2.

20           In accordance with ASME Code Section 3,  
21 Articles NC2160 and NC3120, austenitic stainless steel  
22 is used for compatibility with the environment that the  
23 materials are going to be exposed to.

24           Next slide, please.

25           DCD Table 6.1-1 summarizes the material

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1 specifications for pressure-retaining materials of the  
2 PCCB and other ESF systems that are not part of the  
3 reactor coolant boundary. This table summarizes the  
4 material type as well as the specific grade of material  
5 that is required for each of the components. Similarly,  
6 DCD Table 6.1-2 provides material specifications for  
7 components that will be exposed to the reactor coolant  
8 or containment spray.

9           The RWSP water is borated to approximately  
10 4,000 PPM boric acid at a pH of approximately 4.3.  
11 Crystalline NaTB is stored in baskets inside containment  
12 and is used to raise the pH of the RWSP water from 4.3  
13 to at least 7 in post-LOCA conditions. This pH is  
14 consistent with the guidance for the protection of  
15 austenitic stainless steel from chloride-induced stress  
16 corrosion cracking.

17           Next slide, please.

18           There are no open items related to DCD  
19 Section 6.1.1 for the metallic material specifications  
20 in the DCD.

21           Let's go on and move ahead to the organic  
22 material specifications.

23           With the notable exception of coatings and  
24 electrical insulation, organic materials are not freely  
25 available in containment. All organic materials that

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1 exist in significant amounts in the containment are  
2 identified and quantified in Section 6.2.2.3 of the DCD.

3 In rare cases when coatings do need to be  
4 used inside containment, they are applied in accordance  
5 with Reg. Guide 1.54 and meet the applicable  
6 environmental qualification requirements that are  
7 described in Section 3.11 of the DCD which is for the  
8 EQ program.

9 There are no open items for DCD Section  
10 6.1.2 related to the organic material specifications.

11 This slide provides an overview of the  
12 containment system section of the DCD. The containment  
13 system section of the DCD describes the physical  
14 attributes of the reactor containment and how these  
15 physical attributes address and satisfy the containment  
16 functional design requirements. On the next slides,  
17 we'll be walking through each of the containment  
18 sections including the containment functional design,  
19 the heat removal systems, the secondary material  
20 containment functions, the containment isolation  
21 system, combustible gas control, leakage testing, and  
22 fracture prevention for the pressure vessel.

23 Next slide, please.

24 The US-APWR containment completely  
25 encloses the reactor and the reactor coolant system.

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1 The containment is essentially a leak-tight structure  
2 to ensure that no significant amount of radioactive  
3 material can reach the environment, even in the event  
4 of an RCS failure. The ESF systems that are directly  
5 associated with the containment include the structure,  
6 which is the vessel and the various subcompartments,  
7 the spray system, the isolation system, and the hydrogen  
8 monitoring and control system.

9 The containment is designed as an  
10 essentially leak-tight barrier that will safely and  
11 reliably accommodate the calculated temperature and  
12 pressure conditions resulting from a complete spectrum  
13 of break sizes up and including a double-ended  
14 guillotine break of the reactor coolant or main  
15 steamline. It is designed to be compatible with all  
16 of the environmental conditions that are experienced  
17 during normal operations as well as to withstand a broad  
18 spectrum of seismic events.

19 The US-APWR containment is a pre-stressed,  
20 post-tensioned, concrete structure with a cylindrical  
21 wall, a hemispherical dome, and a flat reinforced  
22 concrete foundation slab that is designed to withstand  
23 the negative pressure of 3.9 psig. The design life of  
24 the US-APWR containment is 60 years. A diagram of the  
25 containment is provided on the next slide.

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1           The containment has three large openings  
2 which include two personal airlocks and an equipment  
3 hatch. The penetrations from mechanical or electrical  
4 equipment go through the containment annulus which has  
5 its own emergency exhaust system for ensuring that the  
6 exhaust from the annulus is filtered before discharge.

7       Note that the main steam line and the feedwater piping  
8 lines are not located in these penetration areas and  
9 are thus not served by the annulus emergency exhaust  
10 system.

11           And finally, the last bullet here covers  
12 one of the unique features of the US-APWR containment  
13 which is the fact that the refueling water storage pit  
14 which is the source of borated water for emergency core  
15 cooling and the containment spray system is located at  
16 the bottom of containment.

17           Next slide, please.

18           MEMBER BANERJEE: Is that the pit, the  
19 depression at the bottom? The next slide. Is that the  
20 pit?

21           MS. STEINMAN: I have pictures of the pit  
22 later on in different slides. This is actually just  
23 showing the structural parts of the containment.

24           MEMBER BANERJEE: Right, the depression is  
25 to accommodate the pit? Or is that something completely

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1 different?

2 MS. STEINMAN: I believe this here -- no,  
3 it is something completely different.

4 MEMBER BANERJEE: It's something  
5 completely different.

6 MS. STEINMAN: That is correct. There are  
7 pictures that will show that in various other diagrams  
8 later in the presentation.

9 MEMBER BANERJEE: Okay.

10 MS. STEINMAN: This slide actually does  
11 show a diagram of the containment vessel which has an  
12 inner height of approximately 225 feet and an inside  
13 cylinder diameter of approximately 150 feet. The  
14 containment dome and the wall thicknesses are roughly  
15 four feet thick, exact dimensions are provided on the  
16 slides. The overall size of the containment is  
17 essentially in line with conventional PWRs if you scale  
18 up according to the power for the US-APWR.

19 This slide provides a basic summary of the  
20 basic design specifications for the containment vessel.

21 As I stated previously, the US-APWR containment vessel  
22 is a pre-stressed, concrete containment vessel with a  
23 carbon steel liner. The design pressure of that vessel  
24 is 68 psig or 83 psia. The design external pressure  
25 is 3.9 psig and the design temperature of the structure

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1 is 300 degrees Fahrenheit.

2 MHI has evaluated the performance of the  
3 containment system under postulated accident conditions  
4 using GOTHIC and other computer codes. The supporting  
5 design basis calculations are described in Section  
6 6.2.1.1 through 6.2.1.5 of the DCD. The results of  
7 these calculations are incorporated into other aspects  
8 of the design including such things as the EQ program,  
9 the piping design, the sump strainer design, and the  
10 ultimate heat seat design in terms of the energy load.

11 A basic overview of the main assumptions and the results  
12 of each evaluation will be described on the subsequent  
13 slides for this section.

14 First up, is the maximum containment  
15 temperature and pressure analysis which evaluates the  
16 capability of the ESFs under primary and secondary  
17 system breaks. The general purpose thermohydraulics  
18 code GOTHIC is utilized for these analyses using a single  
19 volume containment node that is verified by the  
20 experimental analyses which are listed in parentheses  
21 on this bullet.

22 The results of these analyses are evaluated  
23 against the SRP acceptance criteria that the design  
24 pressure has at least 10 percent margin to the peak  
25 calculated accident pressure and that the peak pressure

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1 reduces to have of its peak value by 24 hours  
2 post-accident.

3 The results of the MHI analyses lead to the  
4 following conclusions. The peak calculated value for  
5 pressure is 59.5 psig which compares to the design value  
6 of 68 psig. And the peak calculated value of  
7 temperature is 284 degrees F. which corresponds to the  
8 design temperature of 300 degrees F.

9 CHAIRMAN STETKAR: Rebecca, that peak  
10 calculated temperature, you carefully said that's under  
11 a LOCA. The -- what I've seen is the peak containment  
12 atmosphere temperature during the design basis main  
13 steam line break is 355 degrees Fahrenheit.  
14 Apparently, in the response to an RAI, you did some  
15 analyses to show that the temperature of the containment  
16 structural elements during that steam line break because  
17 of the duration of the transient remained below the 300  
18 degree Fahrenheit structural qualification  
19 temperature.

20 I had a question about all of the  
21 instrumentation cables, all of the equipment that's  
22 located inside the containment that would indeed be  
23 exposed to the temperature of 355 degrees for some period  
24 of time, short period of time for the peak temperature,  
25 but temperatures in excess of 300 degrees for a longer

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1 period of time.

2           What temperatures are all of that equipment  
3 and cables and instrumentation and cabinets and all of  
4 that stuff qualify to? Can it survive that main steam  
5 line break?

6           MR. SETO: I am Naohiko Seto. The  
7 temperature mitigation method applied to the  
8 containment vessel itself. We assume it's applicable  
9 to the structures with large heat capacities. A more  
10 severe condition, more severe condition applied to them.

11          So it is environmental conditions over 300 degree  
12 Fahrenheit.

13          MEMBER BLEY: Could you say that last part  
14 again?

15          MR. SETO: Environmental conditions for  
16 the components are vulnerable would be higher ones than  
17 300 degree Fahrenheit.

18          MEMBER BLEY: If I understood you right,  
19 you're saying all of the components, electronics,  
20 whatever is in there is qualified to over 350 degrees  
21 Fahrenheit? Is that what you said? I'm not sure.

22          MR. SETO: Containment vessel or concrete  
23 with large heat capacity. For example, almost all of  
24 them are environmental conditions are over 300 degrees  
25 Fahrenheit. So this is a case-by-case --

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1 MR. SPRENGEL: I think this question is  
2 related to Section 311.

3 CHAIRMAN STETKAR: That could -- I  
4 understand how this works. I was going to ask you where  
5 those environmental qualifications are documented. So  
6 you're going to punt the 311?

7 MS. STEINMAN: The EQ program would be  
8 responsible for providing the qualification of the types  
9 of equipment that you mentioned, the electrical cables,  
10 instrumentation, and other components, and that program  
11 is described in DCD Section 3.11 and there's also an  
12 appendix, I believe it's 3D, but I'd have to double  
13 check that to be positively sure, that provides specific  
14 values for different components and what the temperature  
15 pressure and environmental conditions, those items are  
16 exposed to and what they're required to be qualified  
17 for.

18 CHAIRMAN STETKAR: Thanks. We haven't  
19 reviewed DCD Chapter 3 yet. So I will just mark that  
20 question and bring it up when we get to DCD Chapter 3.

21 MR. SPRENGEL: And that will be November  
22 4th and 5th.

23 CHAIRMAN STETKAR: Okay.

24 MEMBER BROWN: Does that include things  
25 like sensors? I heard the words cables and stuff, but

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1 I didn't hear the word electronic sensors.

2 CHAIRMAN STETKAR: They said instruments.

3 MEMBER BROWN: I missed that. That's  
4 fine.

5 MEMBER BANERJEE: So I'm just trying to get  
6 an overall feel for this. The containment is  
7 structurally designed for 300 degrees Fahrenheit, is  
8 that what I understand.

9 MS. STEINMAN: Three hundred degrees  
10 Fahrenheit, that is correct.

11 MEMBER BANERJEE: But there are incidents  
12 or accidents, whatever, which could lead to higher  
13 temperatures?

14 MS. STEINMAN: That is correct.

15 MEMBER BANERJEE: That's correct. And  
16 what is the sort of consequences of that? I didn't get  
17 a clear feel for the answer to John's question.

18 MS. STEINMAN: The answer was that because  
19 of the short duration of the higher temperature profile,  
20 the key capacity of the structural materials are not  
21 expected to raise significantly and so the structural  
22 aspects of the containment are not expected to  
23 experience that higher temperature and they're expected  
24 to remain below the 300 degrees Fahrenheit design  
25 temperature.

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1 MEMBER BANERJEE: So what you've done is  
2 you've done a calculation to show that only the surface  
3 of the structure is heated up. The rest of it is not?  
4 Is that what it means?

5 MS. STEINMAN: Yes.

6 MEMBER BANERJEE: You've done a transient  
7 calculation for this?

8 MS. STEINMAN: We have performed a  
9 transient calculation for this? Yes, we have.

10 MEMBER BANERJEE: For the structures.

11 MEMBER REMPE: And the transient was  
12 selected from design basis events, right?

13 MS. STEINMAN: That is correct.

14 MEMBER BANERJEE: So what was the highest  
15 temperature they were exposed to?

16 MR. SETO: The highest temperature, well,  
17 we have additional -- in addition, we conducted  
18 calculations inside the containment with multinodal  
19 system. I am not sure, however, shorter duration is  
20 a local compartment temperature exceeds 500 degree  
21 Fahrenheit under the assumption over main coolant pipe,  
22 double ended break in the reactor cavity.

23 MEMBER BANERJEE: So then you take the  
24 duration of this and you did a solid structure heat  
25 transfer calculation, applying the boundary condition

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1 on the surface of the structure, if I understand that's  
2 what you did?

3 MR. SETO: Yes.

4 MEMBER BANERJEE: With the  
5 multi-nodalization of the structure? I am not  
6 following exactly what you did. How did you  
7 determine this?

8 high void fraction? Did you do a conduction calculation  
9 for everything?

10 MR. SETO: Yes, initially, we conducted  
11 multi-node pressure and temperature calculation and  
12 after that --

13 MEMBER BANERJEE: Inside the containment?

14 MR. SETO: Yes.

15 MEMBER BANERJEE: For the fluid systems?  
16 For the multi compartments?

17 MR. SETO: Yes.

18 MEMBER BANERJEE: But your calculations  
19 for the overall pressure used only one node, but then  
20 you did additional calculations for the compartments?

21 MR. SETO: Yes.

22 MEMBER BANERJEE: What did you use? Did  
23 you use GOTHIC for the one node calculation, right?  
24 So what did you use for the multi-compartment  
25 calculations?

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1 MR. GEORGE: We used GOTHIC for the  
2 multi-node as well.

3 MEMBER BANERJEE: You used GOTHIC as well?  
4 Okay.

5 By the way, there's a little misprint in  
6 the SER where the unequal temperature capability of  
7 GOTHIC is attributed to different velocities. It's not  
8 that. So just you have to correct your SER on that point.  
9 I'll point it out to you.

10 Okay, the non-equilibrium capability comes  
11 from the ability to handle different temperatures, not  
12 different velocities. Anyway, going back to your point  
13 about -- so you used GOTHIC for the compartments, right?

14 MR. SETO: Yes.

15 MEMBER BANERJEE: And now you've got the  
16 temperatures in each compartment?

17 MR. SETO: Yes.

18 MEMBER BANERJEE: And you got the duration.  
19 How did you then do the solid structure calculations?

20 MR. SETO: Solid structure calculations  
21 are conducted to separate from the containment pressure  
22 and temperature calculations, results from the pressure  
23 temperature calculation incorporated as a boundary  
24 condition.

25 MEMBER BANERJEE: So you applied the

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1 boundary condition. Was that a 1D or a 3D calculation?

2 Because I see allusions to 1D calculations. Did you  
3 do a full 3D calculation of the solid structures?

4 MR. SETO: No, just 1D.

5 MEMBER BANERJEE: 1D, okay. So how did you  
6 determine that the structure was not exposed to more  
7 than 300 degrees or whatever the design temperature was?  
8 From this 1D calculation?

9 MS. STEINMAN: So you would like to have  
10 a complete understanding of the methodology that we used  
11 to determine that the containment structures do not heat  
12 up to the higher temperatures associated with the main  
13 steam line break?

14 MEMBER BANERJEE: Or whatever -- I mean  
15 there are many accidents here.

16 MS. STEINMAN: That is correct.

17 MEMBER BANERJEE: Which will give you local  
18 temperatures above 300 degrees Fahrenheit. So I would  
19 like to understand how you did the calculation to  
20 determine really that you would not get an unacceptable  
21 temperature in any region of the containment. So I mean  
22 I don't really understand what you mean by designed to  
23 300 degrees Fahrenheit because there will clearly be  
24 regions of the containment which will be exposed to  
25 higher temperatures. Do you mean bulk? Do you mean

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1 on the surface? Do you mean -- you know, what does that  
2 statement mean? And how do you show conformance to  
3 that?

4 MS. STEINMAN: I believe we'll take that  
5 back as an action item to address?

6 MEMBER BANERJEE: I think it's just a point  
7 for clarification. I'm sure you've done the  
8 calculations. I just want to know.

9 MS. STEINMAN: Right. I think we just  
10 don't have the relative expert to provide the details  
11 of that calculation.

12 MEMBER BANERJEE: That would be cleared  
13 under Chapter 3? Or will you --

14 CHAIRMAN STETKAR: That's not an EQ.  
15 That's a structural --

16 MEMBER BANERJEE: Yes. But I mean --

17 CHAIRMAN STETKAR: That's a different  
18 issue.

19 MEMBER BANERJEE: It depends on where you  
20 want to discuss it, but we should certainly discuss it  
21 to satisfy ourselves.

22 Again, to repeat the question just for  
23 clarification, when you say it's designed for 300  
24 degrees Fahrenheit, what does that mean exactly? Does  
25 it mean that regions can be briefly exposed to higher

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1 temperatures and if so, for how long? You know, that's  
2 the question.

3 And then how did you calculate the  
4 temperatures and what did you find? So if you did 1D  
5 calculations, is it then true that the 1D is sufficiently  
6 accurate even in the compartments and regions like that?

7 Or did you actually do some 3D calculations with the  
8 appropriate boundary conditions? I'm prepared to  
9 accept that within a compartment you've got well-mixed  
10 conditions or relatively well-mixed conditions. So you  
11 can probably apply the temperature field and the  
12 pressure field rather than boundary condition, but then  
13 how do you do that calculation after that?

14 MR. SPRENGEL: So we'll be taking two  
15 actions out of this one for Section 311 on NEQ and the  
16 other one will be tied to Section 3.8 and the structural  
17 evaluation.

18 MEMBER BANERJEE: By the way, are you going  
19 to discuss these GOTHIC calculations and things when  
20 you come up with these 59.5 psig? For example, were  
21 you planning to give us a little bit more detail on how  
22 this was done or is the staff going to tell us how they  
23 agreed with you on this? I don't know.

24 MS. STEINMAN: I believe the staff includes  
25 some of their confirmatory calculations to describe how

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1 they agree with our calculations. If you have specific  
2 questions associated with any of the information in the  
3 DCD, we would be prepared to talk about that, but our  
4 presentation currently does not include those details.

5 MEMBER BANERJEE: So for example, if I  
6 understand it, you used a one node calculation in GOTHIC,  
7 right?

8 MS. STEINMAN: That is correct.

9 MEMBER BANERJEE: But what did you do with  
10 the compartment analysis? You then divided -- did you  
11 do a more detailed nodalization? That's not completely  
12 clear. That's why I'm asking the question. What was  
13 your methodology? How did you go through this? And  
14 how did you validate that you were correct?  
15 Why isn't it 62.5?

16 MR. SETO: We will be able to report later.

17 Because right now the calculations are underway.

18 MS. STEINMAN: So as will be shown on the  
19 next slide, the subcompartment methodology is described  
20 in MUAP-07031 and that report describes the specific  
21 methodology associated with the subcompartments and  
22 which specific subcompartments were evaluated.

23 MEMBER BANERJEE: Can you just tell us in  
24 words what it was? How you did it in five words or a  
25 paragraph so we don't need to go and look in detail?

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1 You can always give us reference to 50 reports. There's  
2 no way I can read 100 or 200 reports. Can you just tell  
3 me in brief what you did?

4 MR. SETO: We have not submitted the report  
5 regarding this methodology yet.

6 MEMBER BANERJEE: Okay. That's fine, but  
7 can you just qualitatively describe what you did? You  
8 took each subcompartment as a volume or did you subdivide  
9 them further or what did you do?

10 MR. SETO: Only containment dome is  
11 subdivided. Other compartments below operation floor  
12 are modeled for each compartment.

13 MEMBER BANERJEE: That clarifies what you  
14 did. So basically you divided the dome. You nodalized  
15 that. And then every other compartment or  
16 subcompartment you took as one volume?

17 MR. SETO: Yes, one volume.

18 MEMBER BANERJEE: With some connection?

19 MR. SETO: Okay.

20 MEMBER BANERJEE: And that report is still  
21 to be submitted, the detailed calculation methodology?

22 MR. SETO: Not submitted.

23 MEMBER BANERJEE: Not submitted, okay. So  
24 when do we get a chance to review this methodology and  
25 these are interesting and important calculations you're

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1 doing, so when do we get into the details of this?

2 MR. SETO: Well, we have been -- we have  
3 thought this item as a matter --

4 CHAIRMAN STETKAR: Sir, could you speak up  
5 a little bit? Either pull the microphone towards you  
6 a little bit because our recorder is having a difficult  
7 time picking you up. Thank you.

8 MR. SETO: Because we have our thought that  
9 this matter is regarding Chapter 3 so on this time, now  
10 so we have not prepared the report of calculation  
11 methodology.

12 MEMBER BANERJEE: So when it comes to  
13 Chapter 3, you will describe in more detail what you  
14 did here? These are just the results that you're  
15 showing here? I just don't understand when we are going  
16 to --

17 CHAIRMAN STETKAR: I think what we're  
18 asking and you made reference to MUAP-07031. I'm just  
19 looking through my notes feverishly here. I don't think  
20 I've ever read that report.

21 MEMBER BANERJEE: It hasn't been  
22 submitted.

23 CHAIRMAN STETKAR: I have a copy of it.  
24 It's an 2009 version. But is that report prepared to  
25 support the containment structural analyses for Chapter

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1 3 of the DCD? It is a subcompartment analysis report.

2 That's essentially what's in it. When do we have the  
3 opportunity to kind of ask these probing questions about  
4 those analyses, if not today, then is it part of the  
5 Chapter 3 review. If not part of the Chapter 3 review,  
6 then when is it?

7 MEMBER SCHULTZ: And is that the report  
8 that you refer to in the second bullet where you describe  
9 the GOTHIC code and it's verification against the  
10 experimental analyses?

11 MS. STEINMAN: So the subcompartment  
12 analysis that I described in MUAP-7031 is not the report  
13 that supports this particular analysis. It reports the  
14 subcompartment analysis which is described on the next  
15 slide. That analysis doesn't determine the temperature  
16 effects which are part of this analysis. The  
17 methodology for this analysis for the maximum  
18 containment pressure and temperature analysis, where  
19 is that described?

20 MR. SETO: The methodology for the maximum  
21 containment pressure and temperature analysis are  
22 described in DCD itself, but it is for single nodal  
23 calculations.

24 MEMBER BANERJEE: That is the single node  
25 calculation which I think the staff also did

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1 confirmatory calculations, right? But the  
2 subcompartment analysis has still to be submitted from  
3 what I understand?

4 MR. SETO: EQ calculation and  
5 subcompartment analysis are different because  
6 subcompartment analysis methodology is in compliance  
7 with regulation so calculation is performed under  
8 assumption or some EQ temperature. Very different  
9 features.

10 MR. SPRENGEL: Please clarify which report  
11 contains the methodology to be submitted?

12 MR. SETO: Well, for EQ calculation there  
13 is no idea at the present.

14 MR. SPRENGEL: Please give us a moment,  
15 we'll follow up on this.

16 CHAIRMAN STETKAR: We have a two-day  
17 meeting scheduled here, so some time during the --

18 MEMBER BANERJEE: So I'm trying to  
19 interpret actually what you said. For the  
20 subcompartment analysis, you assume equal temperatures  
21 with steam and water. For the EQ calculations, you use  
22 the non-equilibrium option and GOTHIC which allows you  
23 to have different temperatures.

24 MR. SETO: Yes.

25 MEMBER BANERJEE: To determine the maximum

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1 temperatures, right? Because the steam temperature  
2 will be different from the water temperature.

3 MR. SETO: Yes.

4 MEMBER BANERJEE: Okay, and you do the  
5 first because that is sufficient to meet the regulatory  
6 requirements, that's the equilibrium assumption. So  
7 is my understanding correct or have I got it wrong that  
8 you do two separate calculations?

9 MR. GEORGE: I'm Tom George, consultant to  
10 MHI. There are basic three GOTHIC models. One is the  
11 single-volume model for peak containment pressure and  
12 temperature conditions which is the subject here today.

13 And there's also a number of subcompartment models  
14 which are for individual compartments within the  
15 containment and those have various number of nodes and  
16 those are not considered the structural temperatures.

17 Those are only for pressure calculations, short-term  
18 pressurization of those compartments. And then there's  
19 a third model for the EQ analysis which is outside of  
20 the scope of this meeting at this time.

21 MEMBER BANERJEE: Which uses --

22 MR. GEORGE: Multi-volume model.

23 MEMBER BANERJEE: Multi-volume. So just  
24 to understand the overall situation, the subcompartment  
25 model calculations are done assuming thermal

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1 equilibrium. The EQ calculations are done allowing the  
2 phases to be whatever temperature they want to be, based  
3 on some non-equilibrium calculations. And again, using  
4 GOTHIC?

5 MR. GEORGE: Yes.

6 MEMBER BANERJEE: And from what you told  
7 us earlier, the subcompartments are used primarily,  
8 except for the dome region as one single node. They're  
9 not subdivided further within the subcompartment or did  
10 I get that wrong?

11 MR. GEORGE: For the EQ analysis, that's  
12 correct.

13 MEMBER BANERJEE: Could we have a picture  
14 of what all these analyses are and what each analysis  
15 did? I mean you can refer to 50 reports again, but I  
16 have no way to read these. I don't have the time. So  
17 could we have sort of a table saying these are the  
18 analyses done. This was the sort of nodalization we  
19 used in various places. This was thermal equilibrium  
20 assumption. This was non-equilibrium. And these were  
21 the results. It would be very helpful to have it all  
22 in one place and how would they validate it, you know?

23 MS. STEINMAN: Yes, we can provide that.

24 MEMBER BANERJEE: And what we are having  
25 here also is for the solid structures. It's not clear

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1 sometimes you're doing a 1D calculation, are you doing  
2 sometimes 2D calculations in complicated structures,  
3 how do you apply 1D? I don't know. Maybe your 300  
4 degrees doesn't work for anything except the outer  
5 shell. Where does that apply, the 300 degrees limit?

6 Is it to just the shell of the containment? What about  
7 the internal structures? Is there a limit associated  
8 with that? It's all very fuzzy in my mind. Maybe it's  
9 -- I'm sort of a thermal hydraulics guy. I like to have  
10 precision and detail of what's going on. So, some  
11 clarification.

12 MEMBER SCHULTZ: The other piece that would  
13 be helpful is where for each of these three analyses  
14 where the results and the methodology is documented,  
15 because it sounds as if the EQ is somewhere, but not  
16 identified.

17 MS. STEINMAN: Right, there is summary  
18 level information for each one of the analyses in the  
19 DCD and then, of course, there are technical reports  
20 that support some of the analyses in more detail.

21 MEMBER SCHULTZ: But including that on the  
22 map that Sanjoy is describing would be very helpful.

23 MS. STEINMAN: Thank you.

24 MEMBER BANERJEE: And the DCD is evolving  
25 under us. The flow paths are changing and all sorts

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1 of things are happening. So are you redoing all this  
2 analysis? What's happening?

3 MS. STEINMAN: There have been RAIs related  
4 to that that we'll discuss a little bit later.

5 MEMBER BANERJEE: Okay. And you know, of  
6 course, now you're going to hydrogen where I have 100  
7 questions.

8 MS. STEINMAN: Well, in this case, we just  
9 have summary conclusions on this slide, that the results  
10 of the analyses for the maximum containment pressure  
11 and temperature analyses demonstrate that the  
12 containment withstands the external pressures up to 3.9  
13 psig which we have a typo on this slide. It does say  
14 psia, but it should be psig. And that the  
15 pressurization due to hydrogen burn is demonstrated to  
16 be within the structural capability of the vessel. And  
17 in the cases of these particular calculations they are  
18 performed with severe assumptions as inputs to these  
19 such as a loss of off-site power and a single failure  
20 in addition to online maintenance. So you have trains  
21 that are out of service in conjunction with the spectrum  
22 of breaks that are analyzed up to the double-ended pipe  
23 break. And we understand that you're looking for more  
24 detail about the specific methodology associated with  
25 --

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1 MEMBER BANERJEE: So with the hydrogen,  
2 clearly burned, there are questions about how you handle  
3 the igniters and deflagration to detonation,  
4 transitions because there's a lot of detail there  
5 somewhere which I haven't had the time to go through.  
6 But once you start to open this can of worms, I'm sure  
7 there's going to be a lot of questions.

8 Are you going to treat that later or have  
9 you already discussed this?

10 MS. STEINMAN: There's some basic  
11 information in this presentation regarding the  
12 igniters, but the specific calculations are not  
13 described in this presentation.

14 MEMBER BANERJEE: So where are those  
15 specific calculations done and when will it be  
16 discussed?

17 MS. STEINMAN: They're done under Chapter  
18 19.

19 MEMBER BANERJEE: Have we done that  
20 already?

21 CHAIRMAN STETKAR: We have done that  
22 already.

23 MEMBER BANERJEE: Somebody went through  
24 all these calculations, deflagrations and stuff.

25 CHAIRMAN STETKAR: The simple summary is

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1 you don't get to a detonation because they just assume

2 --

3 MEMBER BANERJEE: It burns.

4 CHAIRMAN STETKAR: A burn.

5 MEMBER BANERJEE: I'm sure the staff has  
6 asked these questions.

7 CHAIRMAN STETKAR: The staff did have --  
8 we did discuss some of this in Chapter 19 and the staff  
9 did indeed have several questions about locations of  
10 the igniters, reliability of the igniters, MHI made some  
11 design changes and the staff did ask several questions  
12 about compartmentalization effects. So at not your  
13 level of detailed analysis probably because those of  
14 us who are sitting in the room don't have your special  
15 expertise, but we did discuss a lot of those issues at  
16 that level and the staff did do a fairly, I think, a  
17 fairly extensive review.

18 MEMBER BANERJEE: Do you recall what was  
19 the calculation code they used?

20 CHAIRMAN STETKAR: No.

21 (Laughter.)

22 I, too, can rattle off codes that you've  
23 never heard anything about and wouldn't remember.

24 (Laughter.)

25 MEMBER BANERJEE: Maybe this is a

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1 specialized code of some sort.

2 CHAIRMAN STETKAR: We can look it up.

3 MEMBER REMPE: Wasn't ERI involved in the  
4 review?

5 CHAIRMAN STETKAR: I think ERI was because  
6 you had some questions for ERI.

7 MEMBER REMPE: Right. I think they had  
8 their own -- again --

9 CHAIRMAN STETKAR: I don't recall. But  
10 there was, I know the staff asked several RAIs and I  
11 know the RAIs --

12 MEMBER BANERJEE: They're very critical in  
13 this.

14 CHAIRMAN STETKAR: Right. Okay.

15 MEMBER BANERJEE: So that's been covered  
16 and everybody is satisfied that these igniters that have  
17 been modified.

18 CHAIRMAN STETKAR: It's been covered. We  
19 get another shot at it in the next phase, in the final  
20 phase.

21 MR. SPRENGEL: I think the categorization  
22 was correct though. There was many questions by the  
23 staff and there were adjustments made.

24 CHAIRMAN STETKAR: There were.

25 MR. SPRENGEL: And additional analyses

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1 run.

2 CHAIRMAN STETKAR: There were power  
3 supplies. At one time there might have been an igniter  
4 in the RWSP space and that doesn't exist any more.

5 MR. SPRENGEL: So there were some concerns  
6 identified.

7 CHAIRMAN STETKAR: And compressurizer  
8 compartment and things like that.

9 MR. SPRENGEL: MAP and GOTHIC are the codes  
10 used.

11 MEMBER BANERJEE: And the mixing  
12 calculations were done how? With GOTHIC?

13 MR. SPRENGEL: GOTHIC, right.

14 MEMBER BANERJEE: Okay. Did you do any CFD  
15 calculations of any sort?

16 MR. SETO: No. No CFD calculations  
17 besides GOTHIC.

18 MEMBER BANERJEE: Okay. Let's move on  
19 since this has been covered.

20 MS. STEINMAN: Next one of our containment  
21 functional design areas that we would like to cover in  
22 terms of the calculations that were performed, this is  
23 compartment analysis. Technical report, MUAP-07031,  
24 as I previously mentioned is the technical report that  
25 describes the subcompartment analysis and it provides

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1 information regarding the pressures in the reactor  
2 cavity, the steam generator compartment, the  
3 pressurizer compartment, regenerative heat exchange  
4 room, regenerative heat exchange valve room, and the  
5 letdown heat exchanger room.

6 M-RELAP5 was used to calculate the mass and  
7 energy release rate and GOTHIC was used to calculate  
8 the pressures in the individual's compartment. The  
9 analysis conditions for the pressure calculations  
10 comply with the requirements in SRP 6.2.1.2.

11 CHAIRMAN STETKAR: I think this is the  
12 appropriate time to ask this question and tell me that  
13 it's not if it's not. When I went through the  
14 subcompartments, you list on this slide however many,  
15 one, two, three, four, five, six specific  
16 subcompartments. In the DCD, the pressurizer spray  
17 valve room is explicitly excluded from the  
18 subcompartment analyses. And Section 6.2.1.2.2 says  
19 that there is no postulated pipe break location in the  
20 pressurizer spray valve room because the terminal ends  
21 of pressurizer spray line are not located in the  
22 pressurizer spray valve room and pressurizer spray line  
23 -- in the pressurizer spray valve room is designed that  
24 the maximum stress range and cumulative usage factor  
25 as calculated by the ASME code and so forth.

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1 I don't understand the rationale for  
2 excluding the pressurizer spray valve room. The  
3 pressurizer spray pipe -- I mean the valve, as indicated  
4 by the name, the valve room I'm pretty well assuming  
5 includes the pressurizer spray valves. Just a guess.

6 Pressurizer spray valves are normally  
7 pressurized to reactor coolant system pressure.  
8 They're at the discharge line of the reactor coolant  
9 pumps. So they're operating at reactor coolant system  
10 pressure. The same as all the other reactor coolant  
11 system piping that's designed to all the same codes that  
12 you reference in that statement that I read. So if I  
13 can get a reactor coolant system piping break in another  
14 subcompartment that could pressurize that  
15 subcompartment, why can't I get a break in the pressurizer  
16 spray piping or blow out a pressurizer spray valve and  
17 pressurize the pressurizer spray valve compartment?

18 MR. SETO: Well, at present MHI's piping  
19 safeguard policy can exclude the break assumption for  
20 this piping. However, it is now reexamined. So maybe  
21 -- well, sorry. I --

22 (Pause while conferring.)

23 MR. SPRENGEL: John, for clarification, on  
24 the introduce of your question, are you referring to  
25 the section about the pressurizer spray valve room and

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1 that there are no postulated type break locations in  
2 that room?

3 CHAIRMAN STETKAR: The statement in the DCD  
4 basically says that. It says there are no postulated  
5 pipe break locations in the pressurizer spray valve  
6 room. Because the terminal ends of the pressurizer  
7 spray line are not located in the pressurizer spray valve  
8 room, and the pressurizer spray line in the pressurizer  
9 spray valve room is designed that the maximum stress  
10 range and the cumulative usage factor as calculated by  
11 the ASME code, Section 3 does not exceed the allowable  
12 in accordance with the criteria described in subsection  
13 DCD 3.6.2.1.1.2 is the entire sentence.

14 Now what that basically says is there are  
15 no terminations of the piping in that room and the piping  
16 in the room is designed according to ASME code. I submit  
17 that all of the piping that's connected to reactor  
18 coolant system is designed to the ASME code, so if you  
19 postulate breaks in that piping and other compartments,  
20 I don't see that as a rationale for not postulating a  
21 break here and I'm not sure what you mean by the terminal  
22 ends of the pressurizer spray valve spray line are not  
23 located in the room because I'm just presuming because  
24 of the room name that it's got these pressurizer spray  
25 valves in there. Now those are not the termination of

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1 the spray line at the pressurizer or at the reactor  
2 coolant loop, but indeed there are welds or some sort  
3 of connections to the spray valves and the spray valves  
4 themselves, I would assume are in that room. So it's  
5 not just a smooth straight run of pipe that goes through  
6 the room. It has some sort of connections in there.

7 So I didn't understand that whole rationale. It's  
8 certainly a pressurized line by definitions. It's  
9 designed to ASME code because of its connection to the  
10 reactor coolant system. I can't understand the  
11 rationale for excluding breaks in that location.  
12 That's the only rationale that's given. And quite  
13 honestly, the SER regarding this just says the applicant  
14 did not perform a subcompartment analysis for the  
15 pressurizer spray valve room because there is no piping  
16 postulated breaks inside this room.

17 Okay? Well, they didn't ask you. I'm  
18 asking you to justify why there aren't breaks possible  
19 in this room?

20 MEMBER BANERJEE: Is there some LBB  
21 criteria --

22 CHAIRMAN STETKAR: No.

23 MEMBER BLEY: No.

24 CHAIRMAN STETKAR: Not for this line.  
25 Pressurizer surge line only.

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1 MR. SPRENGEL: This is just pointing back  
2 to the ASME code as you identified.

3 CHAIRMAN STETKAR: Yes, but I mean the ASME  
4 code applies to any other piping section anywhere --

5 MS. STEINMAN: So you are looking for the  
6 explicit reason why this particular chunk of piping is  
7 excluded.

8 CHAIRMAN STETKAR: Exactly, for example,  
9 the pressurizer compartment, all of that piping and  
10 everything else in that compartment is designed to the  
11 ASME code as is the steam generator -- just citing the  
12 ASME code as a design basis doesn't by itself exclude  
13 this room because you could cite the same types of code  
14 requirements for any of the other six locations there.

15 MS. STEINMAN: I believe this exclusion  
16 might be in GCD Chapter 3, but I'm not familiar with  
17 it off the top of my head --

18 CHAIRMAN STETKAR: Now wait a minute, GCD  
19 Chapter 3, explicitly excludes the pressurizer spray  
20 valve room --

21 MS. STEINMAN: No --

22 (Laughter.)

23 MS. STEINMAN: I think the general  
24 exclusions associated with different piping are  
25 described there.

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1 MR. SPRENGEL: She's correct. Section 3.6  
2 actually goes through what are selected for postulated  
3 pipe breaks. It goes through in detail terminal ends  
4 may be excluded. I think there is an open question that  
5 we need to follow up on with this item and it does kind  
6 of come back to your point about the valves.

7 CHAIRMAN STETKAR: That's right. I mean  
8 I'm not sure what a terminal end means. I understand  
9 this connection to the pressurizer and the reactor  
10 coolant loop, but it would seem that there are -- I'm  
11 assuming they're welded in place and not flanged, would  
12 seem that they're welded connections in this room, other  
13 than the normal straight pipe --

14 MR. SPRENGEL: The terminal, they give  
15 examples and a more explicit definition of what that  
16 means.

17 CHAIRMAN STETKAR: Anyway, let me just  
18 raise the question and see if you can follow up.

19 MR. SPRENGEL: Your question is actually  
20 relying on the 3.6 evaluation. So give us a little time  
21 and we'll see what we can answer here, if not, in the  
22 meeting next month for Chapter 3.

23 CHAIRMAN STETKAR: Thanks, Ryan.

24 MS. STEINMAN: Would you like to move on  
25 --

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1 CHAIRMAN STETKAR: Is it GCD Section 3.6?

2 MR. SPRENGEL: It's actually points to  
3 Section 3.6.2.1.1.2.

4 CHAIRMAN STETKAR: DCD, not GCD.

5 MR. SPRENGEL: Yes.

6 CHAIRMAN STETKAR: But that's just the  
7 design criteria as I understood it.

8 MR. SPRENGEL: It's actually a section on  
9 postulation of pipe breaks.

10 CHAIRMAN STETKAR: Okay. Anyway, get back  
11 to us and see if that -- I did not look at what section.

12 MS. STEINMAN: So MHI has evaluated the  
13 mass and energy for containment pressure for both LOCAs  
14 and secondary pipe breaks. And this slide provides a  
15 very high-level overview of those analyses.

16 The LOCA mass and energy analysis is  
17 described in the approved topical report, MUAP-07012.

18 This analysis uses the SATAN and WREFLOOD codes  
19 modified with US-APWR specific features and the GOTHIC  
20 code in conjunction to cover the mass and energy release  
21 aspects of the evaluation for blowdown, refill, core  
22 re-flood, and long-term core cooling. The limiting  
23 conditions for the pressure calculation are the cold-leg  
24 double-ended break with a Cd equal to 1 and two SI pumps  
25 operating under LOOP conditions.

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1 For the secondary piping system mass and  
2 energy releases, MHI has used the MARVEL-M code for the  
3 mass and energy release calculation for the main steam  
4 line break with a spectrum of break area and power  
5 generation levels. The MARVEL-M code is described in  
6 the topical report, MUAP-07010.

7 MEMBER BANERJEE: This is for the overall  
8 containment calculation, right? This is not for the  
9 subcompartment?

10 MS. STEINMAN: That is correct. And in the  
11 case of the secondary piping system, the limiting  
12 conditions for containment pressure are a double-ended  
13 break with Cd equal to 1 at 102 percent power. And would  
14 be a main steam line break.

15 Next slide, please.

16 And the final analysis that we're going to  
17 discuss this morning is the minimum containment pressure  
18 for ECCS capability study. These analyses were  
19 performed to confirm the conservatism and validity of  
20 the ECCS performance evaluation in Chapter 15. The  
21 boundary conditions for the large break LOCA PCT are  
22 determined using WCOBRA/TRAC as described in MUAP-0711.

23 The mass and energy release used for the analysis is  
24 consistent with the nominal large break LOCA case and  
25 other assumptions are selected to conservatively choose

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1 initial conditions that result in maximizing the  
2 depressurization.

3 The minimum containment pressure is  
4 calculated using GOTHIC in accordance with the guidance  
5 of SRP 6.2.1.5 and BTP 6-2.

6 MEMBER BANERJEE: What were the -- were  
7 there different assumptions made for the subcompartment  
8 analysis that you did in terms of pressurization and  
9 temperatures? Did you assume leak before break and  
10 things like that? Will you be describing that later  
11 on for the subcompartment?

12 MR. SETO: Excuse me, do you mean --

13 MEMBER BANERJEE: The analysis --

14 MR. SETO: Before break?

15 MEMBER BANERJEE: Yes. Where did you  
16 apply those criteria?

17 MR. SETO: LBB is applied to the  
18 subcompartment analysis only. So maximum containment  
19 pressure and temperature variation calculation. LBB  
20 is not applied.

21 MEMBER BANERJEE: I know for the maximum,  
22 it is not. But for the subcompartment analysis, what  
23 were the set of assumptions you made or will you describe  
24 these later? I don't know.

25 I see. You're saying two specific areas

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1 remain open. Okay, containment --

2 MS. STEINMAN: That is correct.

3 MEMBER BANERJEE: Okay.

4 CHAIRMAN STETKAR: Just for clarification,  
5 I was trying to look up things, but perhaps I can get  
6 the answer more quickly. You only applied leak before  
7 break considerations for the pressurizer surge line,  
8 is that correct? Or did you apply those for other  
9 locations?

10 MR. SETO: No, it is applied --

11 MR. KATSURA: My name is Yoksue Katsura.  
12 LBB is applied to the coolant loop piping main steam  
13 line piping. For these pipings, LBB is applied.

14 MEMBER BANERJEE: So the failures that were  
15 considered for your subcompartment analysis were what  
16 exactly? What failures do you apply?

17 MR. GEORGE: Go back to the previous slide.  
18 Two slides. What line were you assumed to break and  
19 say --

20 MR. SETO: All the way up the cavity. We  
21 assume direct injection line break, double ended.

22 MEMBER BANERJEE: What was the diameter?  
23 Eight inches?

24 MR. SETO: Four. And for steam generator  
25 compartment we assume main feeder with the line break

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1 and pressurizer compartment, surge line -- no surge line  
2 -- applied to surge line breaks.

3 MEMBER BANERJEE: Spray line?

4 MR. SETO: Yes, spray.

5 MEMBER BANERJEE: So the spray line was  
6 allowed to break?

7 MR. SETO: For pressurizer compartment.

8 MEMBER BANERJEE: Okay. So they were all  
9 below eight inches?

10 MR. SETO: Yes, below eight inches.

11 MEMBER BANERJEE: Above eight inches you  
12 apply -- you assume they don't break? I'm just trying  
13 to understand the logic of what you did? Is it in SRP  
14 6.2.1.2 or whatever?

15 MS. STEINMAN: I believe these criteria are  
16 covered in Chapter 3 as well.

17 MR. KATSURA: This is the 3.6.3.

18 CHAIRMAN STETKAR: 3.6.3 discusses the  
19 leak before break criteria for high-energy line pipe  
20 breaks. But as I read Section 6.2.1.2, it was my  
21 understanding that only breaks of the pressurizer surge  
22 line in the pressurizer compartment were excluded from  
23 the subcompartment analyses due to leak before break  
24 considerations. Now maybe I misinterpreted that and  
25 I'm not sure I can say it twice, but as far as the

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1 subcompartment analyses in Chapter 6 of the DCD, the  
2 only discussion that I saw about leak before break was  
3 related to the surge line and in particular because it's  
4 in the pressurizer subcompartment, elimination of that.

5 So they did look at breaks of smaller lines as they  
6 mentioned, in the pressurizer compartment, but not the  
7 surge line.

8 I didn't see any other exclusion, at least  
9 documented in 6.2.1.2.

10 MEMBER BANERJEE: All I'm looking for is  
11 what was excluded.

12 CHAIRMAN STETKAR: Right, and unless I  
13 misinterpreted something the only -- from a leak before  
14 break consideration, they exclude for high-energy pipe  
15 breaks and pipe whips and all of those sorts of things,  
16 they use the LBB for a larger number of lines and that's  
17 apparently documented in Section 3.6 --

18 MR. HAMAMOTO: This is Hiroshi Hamamoto for  
19 Section 3?

20 CHAIRMAN STETKAR: Yes.

21 MR. HAMAMOTO: Leak before break is over  
22 to six-inch line is considered the break.

23 CHAIRMAN STETKAR: But are those  
24 considerations applied only to limit the analyses for  
25 pipe whips and blowdown effects and that type of issue,

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1 the more mechanical versus the subcompartment  
2 pressurization and temperature effects that we're  
3 talking about here. And in Chapter 6 of the DCD, I only  
4 saw LBB --

5 MEMBER BANERJEE: Perhaps that's the only  
6 one excluded, I don't know --

7 CHAIRMAN STETKAR: But now I'm a bit  
8 confused about what was excluded or why from the  
9 subcompartment analyses.

10 MR. HAIDER: My name is Syed Haider. I'm  
11 the reviewer for Chapter 6.2.1 and 6.2.2. Yes, I would  
12 like to confirm that the pressurizer surge piping room  
13 was not analyzed based on the leak before break, LBB  
14 approach, and that was the only item that was excluded  
15 from the analysis in our review.

16 CHAIRMAN STETKAR: Now Chapter 3.6, we may  
17 hear other stories about LBB as far as pipe width and  
18 things like that, but those are not part of the  
19 subcompartment analysis for this purpose.

20 MEMBER BANERJEE: So I think you should  
21 confirm that that was only excluded line.

22 CHAIRMAN STETKAR: For the subcompartment  
23 analyses.

24 MEMBER BANERJEE: The specific question is  
25 what was excluded. So the only thing excluded was the

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1 pressurizer surge line. But just confirm that, please.

2 Okay, we can go back.

3 MS. STEINMAN: There is one open item  
4 associated with Section 6.2.1 and as somebody already  
5 pointed out, it is in relation to the subcompartment  
6 analyses and the secondary pipe mass and energy release.

7 RAI 923, Question 6.2.1-21 is the RAI there and it was  
8 related to impacts of the design change that you  
9 mentioned earlier and how they impacted the various  
10 calculations that were covered in this section of the  
11 DCD.

12 MHI has submitted a response to this and  
13 revised the DCD in some cases to provide additional  
14 clarification of how that design impacts the various  
15 calculations, but this RAI is still under review by the  
16 staff and there is on-going discussion for the two areas  
17 on this slide.

18 The staff's presentation covers this  
19 particular open item in detail and so in order to save  
20 time, if it's possible, any additional questions on this  
21 area should probably be held until the staff's  
22 presentation because they have, I believe, two or three  
23 slides on this topic.

24 CHAIRMAN STETKAR: Any other questions on  
25 those topics?

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1 Brian, you're about to say something?

2 MR. SPRENGEL: I think while we're all  
3 still engaged right here, there is a table in the DCD,  
4 Table 6.2.1-17 that provides the results of LBB  
5 evaluations and specifically identifies which ones are  
6 --

7 CHAIRMAN STETKAR: Yes.

8 MR. SPRENGEL: -- identified as leaking and  
9 breaking.

10 CHAIRMAN STETKAR: Yes.

11 MEMBER BANERJEE: You gave us a quick  
12 answer. Is it correct? It's only the pressurizer surge  
13 lines?

14 MR. SPRENGEL: There are one, two, three,  
15 four, five, six, seven. There are seven items  
16 identified.

17 MEMBER BANERJEE: What were the others,  
18 anything significant?

19 MR. SPRENGEL: Main coolant, pipe hotleg,  
20 coldleg, crossover leg, pressurizer surge line,  
21 accumulator, injection line.

22 CHAIRMAN STETKAR: But those lines are with  
23 the exception of the surge line, those lines are out  
24 in what I'd call the bulk containment atmosphere, if  
25 you will. They would contribute to -- they wouldn't

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1 necessarily contribute to the subcompartment issues  
2 that we're addressing here with the exception of the  
3 surge line because it is in the pressurizer compartment.

4 MR. SPRENGEL: That sounds correct.

5 CHAIRMAN STETKAR: I think back to the  
6 subcompartment analyses, I think that it's true that  
7 the only line break for the subcompartment analyses that  
8 was excluded for leak before break was the surge line.

9 MEMBER BANERJEE: Thanks.

10 MR. SPRENGEL: That was confirmed. And to  
11 go back to the question about the pressurizer spray  
12 valve, it ultimately comes down to the ASME  
13 classification of 6.1.31 and the other system piping  
14 has -- this was your question before about the exclusion.

15 The pressurizer spray valve line is in Table 3.2-2.

16 Sorry, 3.2-2, classification of mechanical systems.

17 That line is identified as it's ASME Class 1 and so  
18 when you go to the section I identified in Chapter 3  
19 --

20 CHAIRMAN STETKAR: Ryan, I want to keep us  
21 a little bit on schedule. We've already established  
22 the fact that breaks of the pressurizer spray valve line  
23 are analyzed in the pressurizer spray -- in the  
24 pressurizer compartment. They are analyzed in the  
25 pressurizer compartment. So regardless of what you say

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1 about ASME classification, the same piping is in both  
2 compartments. That spray line, we already heard it this  
3 morning. I just wanted to cut off this --

4 MR. SPRENGEL: That was just for  
5 clarification.

6 CHAIRMAN STETKAR: Yes. Any other  
7 questions about these issues? I was going to -- well,  
8 we still can break early, but it's not as early as I  
9 thought. What I'd like to do before we get into the  
10 containment heat removal systems because there will be  
11 more discussion is take a break and we'll recess until  
12 10:20.

13 (Whereupon, the above-entitled matter went  
14 off the record at 10:03 a.m. and resumed at 10:20 a.m.)

15 CHAIRMAN STETKAR: Okay, we're back in  
16 session and we continue with containment heat removal  
17 systems.

18 Rebecca?

19 MS. STEINMAN: The containment heat  
20 removal system for the US-APWR is a dual function ESF.

21 The containment spray provides for fission product  
22 removal and containment cooling. The containment spray  
23 and residual heat removal systems share major system  
24 components such as the pumps and the heat exchangers.

25 The containment spray is the focus of Chapter 6, while

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1 the RHI shutdown cooling function is covered in Chapter  
2 5 under Section 5.4.7.

3 The containment spray consists of four dual  
4 purpose RWSP suction lines, spray pumps, and heat  
5 exchangers. And the spray ring header is composed of  
6 four concentric interconnected rings.

7 Next slide, please.

8 The four dual purpose CS/RHR pumps are  
9 provided one for each of the four 50 percent capacity  
10 trains. They are motor driven, centrifugal pumps with  
11 mechanical seals. The pumps are sized to deliver 3,000  
12 gpm at a discharge head of 410 feet.

13 The four CS/RHR heat exchangers are also  
14 provided. They are horizontal tube and shell-type heat  
15 exchangers and the core spray, RHR water system flows  
16 through the tubes at 1.5 E to the fifth pounds per hour  
17 and the component cooling water flows through the shell  
18 side with a design flow rate of 2.2 E to the fifth pounds  
19 per hour.

20 Next slide, please.

21 There are many discussions regarding  
22 GSI-191 in this section of the DCD. As we discussed  
23 earlier, GSI-191 will be the focus of the October 1st  
24 meeting.

25 Next slide, please.

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1           So this slide provides an outline of the  
2           containment spray system. There are four 50 percent  
3           capacity trains containment spray using four  
4           dual-purpose containment spray RHR RWSP suction lines,  
5           the spray pumps and the heat exchangers. And the spray  
6           ring header has four concentric rings as are showed on  
7           this slide.

8           To ensure reliability of the containment  
9           spray pattern, each spray ring is located at a different  
10          containment elevation and the spray rings are supplied  
11          from the four 50 percent capacity trains of the  
12          containment spray. As a result of this header design,  
13          a single failure of one of the pumps does not result  
14          in a loss of a spray ring.

15          Next slide, please.

16          There are two open items associated with  
17          DCD Section 6.2.2. RAI 1036, Question 6.2.2-94  
18          requested additional justification of the tube-side and  
19          shell-side fouling factors provided in Chapter 5 of the  
20          DCD. MHI provided this justification and we believe  
21          that the technical issue associated with this open item  
22          is closed pending staff's final review of the DCD.

23          The other open items associated with  
24          Section 6.2.2 is related to the pump operation under  
25          post-LOCA debris conditions and it is associated with

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1 RAI 840-6096, Question 6.02.02-85 and this item will  
2 be addressed as part of the GSI-191 presentation October  
3 1st.

4 CHAIRMAN STETKAR: Rebecca, when is it  
5 appropriate to ask you about NATB issues, later when  
6 you talk about fission product removal? Now?

7 MS. STEINMAN: I think later when we get  
8 to the fission product removal section.

9 CHAIRMAN STETKAR: Okay. I'll save it  
10 until then.

11 I will ask you one question and this relates  
12 to design. I think it's the time to ask this one. In  
13 Section 6.2.2.5 of the DCD, it says "narrow range  
14 containment pressure is indicated and alarmed in the  
15 main control room and the remote shutdown console. A  
16 single wide-range containment pressure transmitter  
17 provides indication to the MCR and RSC."

18 I have a few questions about that. And I  
19 couldn't find any of the information. I'm mostly  
20 concerned with information available to the operators.

21 What is the displayed pressure range for the  
22 containment narrow range pressure transmitters? And  
23 what is the displayed pressure range for the containment  
24 wide range pressure transmitter, the one -- that you  
25 only have one of?

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1           And because you only have one containment  
2 wide range pressure transmitter, I was curious there  
3 was only one of them. It's sort of related to what the  
4 pressure ranges are in terms of what information is  
5 available to the operators. So for example, if  
6 containment -- if the narrow range only gets you up to  
7 a few pounds, and you only have one wide range pressure  
8 transmitter and many of your LOCA analyses show  
9 pressures exceeding the narrow range, that doesn't sound  
10 like very reliable information for the operators for  
11 those LOCAs or steamline breaks. So that's the genesis  
12 of the question.

13           So I'm interested first in what are the  
14 display ranges on those transmitters and why you only  
15 have one and only one wide range transmitter?

16           MR. OGINO:     This is Ogino speaking.  
17 Narrow range instrument range is 68 psig?

18           CHAIRMAN STETKAR:   Sixty-eight?

19           MR. OGINO:     Basically for maximum  
20 containment design pressure.

21           CHAIRMAN STETKAR:   Okay.

22           MR. OGINO:     And the wide range I forget the  
23 exact number, approximately 1.5 megapascal.

24           MEMBER BANERJEE:   What is that?

25           CHAIRMAN STETKAR:   I don't convert

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1 megapascals in my head. 1.8 megapascal?

2 MR. OGINO: 1.5.

3 MEMBER BANERJEE: What is that in psi?

4 MR. OGINO: This is for the severe  
5 accident.

6 MEMBER BLEY: 220 psi, roughly, 230,  
7 something like that.

8 CHAIRMAN STETKAR: Okay.

9 MEMBER BLEY: A little more.

10 CHAIRMAN STETKAR: Okay, but the important  
11 thing is the two narrow range transmitters do go up to  
12 containment design pressure, 68 pounds. The narrow  
13 range, the upper end of the narrow range is 68 psig.

14 MS. STEINMAN: That is correct.

15 CHAIRMAN STETKAR: That's correct? Okay,  
16 thank you. Then I'm less concerned about there being  
17 only one right range. Thank you. That answers my  
18 questions.

19 MS. STEINMAN: Next slide, please. The  
20 US-APWR design does not utilize a secondary containment;  
21 instead, portions of the primary containment are  
22 enclosed by the containment penetration areas, which  
23 prevent direct release of the containment atmosphere.

24 Under normal operating conditions, the containment  
25 penetration areas are serviced by the auxiliary building

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1 HVAC system and under accident conditions they are  
2 serviced by the annulus emergency exhaust system which  
3 is automatically actuated.

4 The annulus emergency exhaust system  
5 maintains the containment penetration areas at a  
6 negative pressure during accident conditions.

7 This slide shows the penetration areas and  
8 the safeguard components rooms. The penetration areas  
9 which are shown in blue on this slide are located  
10 adjacent to the containment and include all piping and  
11 electrical penetration areas, except for the main steam  
12 and feedwater penetrations. These areas are completely  
13 contained within the reactor building and are designed  
14 to seismic category 1. The penetration areas are  
15 designed for the negative internal pressure that is  
16 provided by the operation of the annulus emergency  
17 exhaust system which is described in a little more detail  
18 on the next slide.

19 The safeguard component areas which are  
20 shown in yellow on this slide, are located adjacent to  
21 the containment and include ECCS components and  
22 containment spray components that are installed outside  
23 of the containment.

24 This slide provides a conceptual diagram  
25 of the annulus emergency exhaust system. The system

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1 consists of two independent and redundant 100 percent  
2 trains in parallel with each train containing a  
3 filtration unit and a filtration unit fan. Each  
4 filtration unit contains a high efficiency pre-filter  
5 and a high efficiency particular air filter. The  
6 annulus emergency exhaust filtration unit fans  
7 automatically start on an ECCS actuation signal and  
8 direct flow to the vent stacks. The auxiliary building  
9 HVAC supply and exhaust lines are also provided with  
10 two dampers in series upstream of the four penetration  
11 area air handling units to ensure isolation of the event  
12 and in the event of a single active failure.

13 CHAIRMAN STETKAR: Before you switch, you  
14 speak very clearly and very fast and I can't keep up  
15 with you shuffling through my notes, so in Section  
16 6.5.1.2, the annulus emergency exhaust system inlet and  
17 exhaust dampers are normally closed, right?

18 MR. OGINO: Yes.

19 CHAIRMAN STETKAR: The emergency inlet --  
20 okay. They're indicated as electrohydraulic  
21 operators. If I look at figure 6.5-1 in the DCD, they're  
22 electrohydraulic operators and it's indicated that they  
23 fail in the closed position. Why are those dampers  
24 designed to fail in the closed position? It seems that  
25 I would really like them to open under emergency

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1 conditions. And I recognize that they're redundant  
2 parallel dampers. And that one train is sufficient,  
3 but I don't know why they're designed to fail closed?

4 Why aren't they designed to fail open for example?  
5 There must be some design -- why are they designed to  
6 fail closed?

7 MS. STEINMAN: We have somebody coming up  
8 to address this question.

9 MR. HOTCHKISS: My name is Marc Hotchkiss,  
10 representative of MHI.

11 I'm not sure of the exact design reason why  
12 they fail closed because you mentioned the system still  
13 accomplishes its safety function because of the dual  
14 100 percent capacity emergency filter units.

15 CHAIRMAN STETKAR: Would it fail to  
16 accomplish its safety function if the dampers failed  
17 open?

18 MR. HOTCHKISS: I do not believe so.

19 CHAIRMAN STETKAR: So my question is why  
20 are they designed to fail closed?

21 MR. HOTCHKISS: We can take that back as  
22 a question to the designers.

23 CHAIRMAN STETKAR: Somebody had to make a  
24 decision and -- I tried to think of bypass blows or any  
25 -- I couldn't divine a reason why they would go closed

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1 rather than open. But if there is one, I'd like to  
2 understand why that is.

3 I got confused by wording in the DCD. This  
4 is the correct configuration. There's one inlet damper  
5 to each train from the safeguards component areas and  
6 one inlet damper to each train from the penetration  
7 areas. Correct?

8 MR. HOTCHKISS: Yes.

9 CHAIRMAN STETKAR: The DCD seems to  
10 indicate that there's two parallel dampers from each  
11 of those suction sources, but the drawings are clear.  
12 Hang on a second.

13 Now, there was --this is a long one. The  
14 SER raised a question about the time to reduce pressure  
15 in the penetration areas in the equipment areas after  
16 an accident. And apparently, there's an analysis done  
17 in MUAP-10020 that shows that the nominal time to  
18 establish the design negative pressure of a quarter of  
19 an inch water gauge in those locations is 180 seconds.

20  
21 It also indicates that the time for the  
22 annulus emergency exhaust system exhaust fan to reach  
23 its design flow rate is 130 seconds. And the  
24 calculations in Section 5.6.1 and 5.6.2 of that MUAP  
25 specifically show that the difference in that time from

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1 130 seconds to 180 seconds, that 50 second time is the  
2 time that's required to actually take pressure from its  
3 normal value down to negative .25 inches.

4 Now, if I take a design basis accident with  
5 a loss of offsite power, the design basis starting time  
6 for a gas turbine generator is 100 seconds. The annulus  
7 emergency exhaust fans are powered from  
8 motor-controlled centers that remain loaded, so they're  
9 not affected by any of the load sequencing on the gas  
10 turbine generators.

11 My question from all of these analyses is  
12 does the cited 180 second time to reduce pressure account  
13 for the time to start the gas turbine generators. In  
14 other words, I'm not sure whether the 130 second time  
15 that's cited in MUAP-10020 that's cited as the time for  
16 the fan to reach its design flow rate, is that the time  
17 for the fan, once I put electricity to the fan motor  
18 for the fan -- these are pretty big fans, to get up to  
19 full-rated speed, or does that 130 seconds also include  
20 the 100 seconds to start the gas turbine generator?  
21 Because if it doesn't, then I've got 100 seconds plus  
22 130 seconds which is 230 seconds already, plus 50 second  
23 drawdown, it's now 290 seconds which is more than 180  
24 and in fact is more than 240 seconds which is assumed  
25 on the LOCA analyses and in the tech specs.

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1           So my question, if you understand it, it's  
2 kind of roundabout, is how do all of these timings work  
3 out with the sequencing of time zero, the accident  
4 happens, start the gas turbines, get the gas turbines  
5 up to speed so that they can energize the bus, get the  
6 fans started and running, get the fan up to speed to  
7 sufficient flow so that it can then draw down pressure  
8 within what at least is shown in the MUAP as an additional  
9 50 seconds.

10           And do all of those sequential times meet  
11 either the 180 seconds that's listed in the MUAP or 240  
12 seconds that's included in the accident analyses? You  
13 probably don't have an answer to that right now. But  
14 I'd like to understand that a little better.

15           MS. STEINMAN: I believe that we understand  
16 the request, but you are correct --

17           CHAIRMAN STETKAR: It's pretty convoluted.

18           MS. STEINMAN: We don't have an answer  
19 right now, but we understand the request and we can get  
20 an answer.

21           CHAIRMAN STETKAR: Okay, thank you. Let  
22 me just see if I had anything else on the -- my notes  
23 are as scattered as the documentation.

24           I don't have anything more on annulus  
25 exhaust. Anybody else, any other subcommittee member?

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1 Okay, thanks.

2 MS. STEINMAN: So now we're moving on to  
3 the containment isolation system. And the containment  
4 isolation system allows for the free flow of normal or  
5 emergency-related fluids through the containment  
6 boundary in support of reactor operations, but  
7 establishes and preserves the containment boundary  
8 integrity.

9 The containment isolation system includes  
10 the system and components including the piping, the  
11 valves, and the actuation logic that establish and  
12 preserve the containment boundary integrity.

13 The criteria for the isolation requirements  
14 associated with the system design are set forth in GDC  
15 54, 55, 56, and 57. The US-APWR containment isolation  
16 system is designed to seismic Category 1, Quality Group  
17 B. The containment isolation valves are identified as  
18 equipment Class 1 or Class 2 as described in DCD Chapter  
19 3, Section 3.2.

20 The containment penetration barriers  
21 consisting of the flange closure, the personnel airlock,  
22 and the equipment hatch are under administrative control  
23 to ensure that they do not impact the containment  
24 isolation.

25 CHAIRMAN STETKAR: Here's another question

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1 about timing. The -- let me see if I can phrase this  
2 a little bit better.

3 This is from the SER, but I'll ask MHI  
4 because it's a system design question actually. In the  
5 SER, it says the staff reviewed the design requirements  
6 of the containment isolation system as described in the  
7 DCD against the acceptance criteria for those provisions  
8 contained in Standard Review Plan Section 6.2.4,  
9 Subsection 2 of the SRP and has confirmed that as  
10 described in DCD Sections 8.3, on-site power systems  
11 and 8.4, station blackout, there is alternate AC power  
12 supply available within 100 seconds which will allow  
13 closure of containment isolation valves which will be  
14 open at the onset of an SBO. So the SER  
15 concludes that you meet the design requirements because  
16 AC power will be available to close valves within 100  
17 seconds.

18 Now, if you look at Section 8 of the DCD,  
19 the electric power systems, the alternate AC gas turbine  
20 generators are designed to reach rated speed and voltage  
21 within 100 seconds, as are the normal emergency gas  
22 turbine generators. The AAC, alternate AC gas turbine  
23 generator start automatically, but they're aligned to  
24 the safety buses manually.

25 And the station blackout analyses account

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1 for a 60-minute, not 60-second, 60-minute time for those  
2 alternate AC gas turbine generators to supply power.

3 So during the cited station blackout conditions where  
4 by definition I only have the alternate AC gas turbine  
5 generators, it's not clear to me how I get power to  
6 containment isolation valves within 100 seconds. It  
7 would seem to be 60 minutes.

8 So my question from the design perspective  
9 is does the US-APWR design contain any normally open,  
10 AC motor operated, containment isolation valves that  
11 must be closed within less than 60 minutes after a  
12 station blackout occurs? Now if the answer to that is  
13 yes, I don't know how you meet the criteria, but I don't  
14 know. I didn't go through every penetration to look  
15 at what valves are motor operated, what valves are  
16 normally open, whether the motor-operated valves are  
17 AC or DC controlled, etcetera. That again, you can't  
18 answer the question right now I suspect. I was going  
19 to ask it to the staff, but you understand why I'm asking  
20 you because it's actually a design-related issue.

21 MS. STEINMAN: We will look at the list and  
22 confirm this and get back to you.

23 CHAIRMAN STETKAR: I mean if the answer is  
24 no, then I don't care.

25 MS. STEINMAN: I'm pretty sure the answer

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1 is no, but --

2 CHAIRMAN STETKAR: I've been surprised in  
3 the past. Okay.

4 MS. STEINMAN: Have we confirmed that the  
5 answer is no?

6 MR. SPRENGEL: I think we'll go ahead and  
7 take this back and follow up based on the resources we  
8 have available, but our initial impression is that  
9 they're DC powered.

10 CHAIRMAN STETKAR: That may be true. As  
11 I said, I didn't go through every -- there's a lot of  
12 penetrations. I don't know even know which ones are  
13 normally open or not. So thanks. I appreciate that.

14 That's all I had on containment isolation. Anybody  
15 else have anything on containment isolation? Speak up.

16 Next topic?

17 MS. STEINMAN: Next topic is combustible  
18 gas control in containment. The containment hydrogen  
19 monitoring and control system consists of two  
20 subsystems, the hydrogen monitoring system and the  
21 system ignition system. The hydrogen monitoring system  
22 consists of one monitor that is located outside  
23 containment and it measures the hydrogen concentration  
24 in the containment air that is extracted to the radiation  
25 monitoring system containment air sampling line. Once

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1 the sampling valves are open, the hydrogen concentration  
2 is continuously indicated in the main control room.

3 MEMBER BANERJEE: Is there any monitoring  
4 within containment at all or do you just have the  
5 ignition systems?

6 MS. STEINMAN: The answer is no, there is  
7 none.

8 MEMBER BANERJEE: There is none?

9 MS. STEINMAN: There is no monitoring  
10 within containment.

11 CHAIRMAN STETKAR: The monitoring actually  
12 comes off the post-accident containment atmosphere  
13 sampling line, right?

14 MS. STEINMAN: That is correct.

15 MEMBER BANERJEE: And all that's being  
16 done, right? What's the logic for that that you don't  
17 need to know what's happening inside containment? It  
18 would seem that if you look at the past, often we haven't  
19 known what's in containment. We've been guessing. So  
20 we will continue to guess? Just informationally, it  
21 would seem prudent to put something inside as well.  
22 Is it not required due to some regulatory thing like  
23 a guide or something?

24 MS. STEINMAN: The system that we have in  
25 place meets the regulatory requirements right now.

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1 it's a non-safety-related system.

2 MEMBER BANERJEE: It seems to me that one  
3 of the big unknowns has always been how much hydrogen  
4 there is in there. We've been guessing and looking at  
5 pulses and their explosions in the past. We've never  
6 had a clear idea. Mitsubishi just wants to conform to  
7 the regulatory requirements? Is that sufficient?

8 MS. STEINMAN: We believe that the system  
9 that we have --

10 MEMBER BANERJEE: You believe? Why do you  
11 believe that?

12 MR. GEORGE: That system does monitor the  
13 in-containment concentration. That is it is sampled  
14 from the inside containment.

15 MEMBER BANERJEE: But it's a well-mixed --  
16 we are hoping it's well mixed?

17 MR. GEORGE: That's right.

18 MEMBER BANERJEE: It may be poorly mixed.  
19 We have no idea. Hydrogen could be stratifying and  
20 going to the dome for all you know. You could have local  
21 concentrations which are well above ten percent unless,  
22 of course, your calculations don't indicate that, but  
23 that may not have any relation to reality.

24 MS. STEINMAN: Right, and I believe those  
25 calculations were performed in support of determining

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1 the location of the igniters which are used to reduce  
2 the hydrogen concentration.

3 MEMBER BANERJEE: Right, but as you know,  
4 we are very poor at doing calculations with stratified  
5 gases. I mean if you look at what's happening, happened  
6 at PANDA, the calculations where they did helium  
7 injection, this is not our strong point. Even with CFD  
8 to do this.

9 While I can sort of -- you meet the  
10 regulatory requirements for the calculations, but that  
11 doesn't mean there's any relationship to reality.

12 MR. SPRENGEL: Is there a specific request  
13 you'd like us to respond to?

14 MEMBER BANERJEE: No, I'm just asking are  
15 you so sure of this that there will be no accumulation  
16 in some region, particularly in the dome that you don't  
17 feel that you would even want to put a monitor? You  
18 know, when I run batteries in my lab, I put hydrogen  
19 detectors, even though there are no so-called hydrogen  
20 releases on the roof of my lab. Just because I'm a  
21 prudent fellow. So I would think that a reactor should  
22 be even more prudent. And I put them at -- because even  
23 at one percent I start to worry, right? This is reality.

24 So it would seem to me that it would be prudent to put  
25 some monitors in the dome regions. It's not necessary,

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1 but I think -- because you meet the regulations does  
2 not mean you meet the requirements for just trying to  
3 be as prudent as possible.

4 MR. SPRENGEL: We'll take that back under  
5 advisement.

6 MEMBER SCHULTZ: We'll get into some  
7 further discussion associated with this, but do you have  
8 -- you have a single-point system.

9 MS. STEINMAN: That's correct.

10 MEMBER SCHULTZ: And you have timing  
11 associated with it that depends on an action of manually  
12 opening containment isolation valve.

13 MS. STEINMAN: That is correct.

14 MEMBER SCHULTZ: So the general question  
15 is do you feel that in the event of a severe accident  
16 that this is a sufficient system to give you indication  
17 of containment of hydrogen that would prevent aspects  
18 of deflagration and other things that might happen.

19 MR. SPRENGEL: So the question is do we feel  
20 the regulations address that? Because it's been  
21 acknowledged that we're following the existing  
22 guidance, so I guess -- is any of the staff available  
23 to speak to --

24 MEMBER SCHULTZ: Well, you have your own  
25 particular system. You've done subcompartment

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1 analyses and you're looking at severe accident analyses  
2 as well. Based on the results of those evaluations,  
3 do you feel what you've proposed here is sufficient for  
4 hydrogen indications? Because you really want to help  
5 the operator, just a general question.

6 MEMBER BANERJEE: Well, if you want to  
7 phrase it slightly differently, how confident are you  
8 that there won't be stratification do to plumes of  
9 hydrogen that may arise and that will be captured in  
10 dome region where you might get higher than the mixed  
11 mean concentrations? And the reason that this is a good  
12 question is the information we have about plume mixing,  
13 it's a very complex phenomena and these buoyant plumes  
14 can actually be very hard to mix, particularly if they're  
15 just sort of emanating and going up the roof regions  
16 which is why I was asking you how you ensure a well-mixed  
17 containment? Do you have fans or how do you do it?  
18 I have no idea.

19 Without going through your calculations for  
20 the mixing in detail which if you want, we can take a  
21 very close look at, if you want to stand up to that  
22 scrutiny, it would be easier just to put something and  
23 measure it. That's all we're saying, I think.  
24 Otherwise, we can go into this in as much depth as you  
25 want to see how well you can defend your mixing in the

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1 containment because the problem is related to mixing.

2 Because also what you're sampling assumes a well-mixed  
3 containment. You've done no CFD studies from what I  
4 understand. You relied on GOTHIC. You've  
5 only nodalized the dome region, right?

6 MR. OGINO: That's correct.

7 MEMBER BANERJEE: We can ask you to look  
8 at PANDA and see how well you predict PANDA with this.

9 MR. GEORGE: GOTHIC has been used --

10 MEMBER BANERJEE: Predict PANDA?

11 MR. GEORGE: PSI uses GOTHIC extensively.

12 MEMBER BANERJEE: Can you make that  
13 available to us to look at that?

14 MR. GEORGE: We have it in papers that have  
15 been presented by PSI. We can make those available to  
16 you.

17 MEMBER BANERJEE: That would be a start.

18 MR. GEORGE: Those were certainly more  
19 detailed though than the models that were used for the  
20 MHI containment. I believe that there was some  
21 information about the mixing of the thermal mixing  
22 contained in the Section 19 of the DCD.

23 MS. STEINMAN: There were analyses  
24 performed to support the determination of the number  
25 of igniters that were needed in their locations and as

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1 part of Chapter 19, the types of calculations that you  
2 were discussing would have been input to those  
3 decisions.

4 MEMBER BANERJEE: One of the concerns and  
5 I think I should be quite clear about this is that if  
6 the plume is not very turbulent and this is low Reynolds  
7 number plume, they mix very poorly and once they're  
8 stratified, it's very hard to mix them. So because  
9 you've got a lighter gas on top of a heavier gas. So  
10 it's not an easy thing to do, you know, and that's really  
11 -- it would be interesting now you say Chapter 19 has  
12 been talked about already and I wasn't here. But that  
13 doesn't mean that we can't revisit it.

14 MS. STEINMAN: Understood.

15 MEMBER BANERJEE: You know and look into  
16 it in detail. All I'm saying is if you've got some  
17 monitors, at least, you know what's going on. These  
18 calculations are very, very difficult, believe me.

19 MS. STEINMAN: I believe we understand your  
20 stated position.

21 MEMBER BANERJEE: Yes. An whatever is in  
22 the regulations may or may not -- it's always a  
23 compromise, but it would be very hard to prove that you  
24 can actually predict these accurately without going into  
25 perhaps the psi level of nodalization which could be

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1 very, very fine. In the end, GOTHIC just does the same  
2 as any CFD code would do. So if you nodalize it  
3 sufficiently finely, yes, you probably get roughly the  
4 right numbers, but it depends on whether you did that.

5 I have expressed my views on this. We will hopefully  
6 revisit Chapter 19 at some point.

7 CHAIRMAN STETKAR: Yes. We're going to  
8 have a separate briefing on updates to the PRA, but I  
9 don't know whether we can raise it during that, but  
10 probably not. We get another shot at the entire safety  
11 evaluation during phase, I always forget, four?

12 MS. STEINMAN: Four or five.

13 CHAIRMAN STETKAR: Four or five, something  
14 like that.

15 MR. SPRENGEL: We can definitely have a  
16 separate discussion on this. We would support that  
17 discussion. I guess we'd have to have some interim  
18 discussion with the staff. I guess the request is  
19 acknowledging meeting existing --

20 CHAIRMAN STETKAR: I think we all  
21 understand what we're all talking about.

22 MR. SPRENGEL: We can discuss those in more  
23 detail at a --

24 MEMBER BANERJEE: But the existing  
25 regulation simply asks you to -- I would imagine predict

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1 that the hydrogen distribution and put the igniters and  
2 things in response to that, right? So we can look into  
3 how you did that calculation still, right?

4 MS. REYES: I only wanted to say and it was  
5 mentioned this was discussed at the September 18 ACRS  
6 meeting back in February, this was an open item. It  
7 was on the hydrogen detonation and it also involves  
8 Chapter 6. Unfortunately, the reviewer is on rotation  
9 outside the division, so he couldn't support this at  
10 this meeting. I can always check at the break and talk  
11 to this reviewer.

12 I'm also the Chapter 19 PM. It's my  
13 understanding that this open item is now closed. I can  
14 check that when I go to my office. but I can always  
15 try to talk to the staff later today at one of the breaks.

16 CHAIRMAN STETKAR: Why don't you see if you  
17 can do that, Ruth, that might help because as I said  
18 it's a two-day meeting, so we have a little bit of time  
19 to follow up on some of these questions.

20 MEMBER BANERJEE: Do you have a reviewer  
21 who had left this as an open item, but recently it's  
22 been closed, is that it?

23 MS. REYES: Correct, it was closed.  
24 Again, if I remember correctly, it was closed after the  
25 ACRS meeting.

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1 MEMBER BANERJEE: That would be helpful to  
2 know.

3 CHAIRMAN STETKAR: Let's just leave it at  
4 that for now.

5 MEMBER REMPE: It was related to the  
6 equipment would survive the environments during the  
7 hydrogen burn.

8 CHAIRMAN STETKAR: Is that what the open  
9 item is? So that's not really what Sanjoy is asking.

10 MEMBER REMPE: Right.

11 MS. REYES: Yes, that was one of my  
12 questions because we were asking about mixing the  
13 Chapter 19 was specifically on hydrogen detonation.

14 MEMBER REMPE: It could be part of Sanjoy's  
15 question because --

16 CHAIRMAN STETKAR: That's fine. It's now  
17 11 o'clock. I want to see if I can get us at least a  
18 little bit on schedule here.

19 Rebecca, why don't we -- unless there's  
20 other questions about this issue, we've got a couple  
21 of either short term or more interim term follow-up  
22 things. Go on to the next slide. The reason I wanted  
23 to get to this is this next slide may help the previous  
24 discussion.

25 MS. STEINMAN: This slide discusses the

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1 hydrogen ignition system and this system is responsible  
2 for -- is designed to limit the combustible gas  
3 concentration to less than ten percent by volume.

4 MEMBER BANERJEE: But based on mixed mean  
5 ten percent? Or is it ten percent LOCA?

6 MS. STEINMAN: It's a mixed value.

7 MEMBER BANERJEE: Okay.

8 MS. STEINMAN: It consists of 20 hydrogen  
9 igniters powered by non-Class 1E GTGs. Eleven of these  
10 igniters are also powered by dedicated batteries in  
11 addition to the alternate AC source. The batteries are  
12 capable of supplying power for at least 24 hours.

13 MEMBER BROWN: Before you go on, why 11 as  
14 opposed to -- is there a technical basis for only needing  
15 battery backup for 11 of the 20 igniters? I looked in  
16 the DCD and couldn't find.

17 MS. STEINMAN: I believe that was discussed  
18 as part of the Chapter 19 RAI response.

19 MEMBER BROWN: Do you know what the answer  
20 is?

21 MR. SPRENGEL: There was an evaluation done  
22 to determine both the amount of igniters needed and the  
23 specific igniters needed.

24 MEMBER BROWN: That you needed to have the  
25 additional backup on the batteries?

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1 MR. SPRENGEL: At a minimum, correct, yes,  
2 it is. Yes.

3 MEMBER BLEY: Is that based on one  
4 particular accident? Do you remember? We haven't  
5 talked about that yet.

6 MEMBER BROWN: There's a discussion about  
7 distribution of these, the subcompartments and --

8 MEMBER BLEY: There's isolation between  
9 subcompartments.

10 MR. SPRENGEL: This was part of the item  
11 that Ruth was mentioning, but this has not all been  
12 completed by our presentation at the last meeting.

13 CHAIRMAN STETKAR: Right, Chapter 19, this  
14 was in a state of flux at that time. So in terms of  
15 subcommittee members' confusion, you're justified as  
16 being confused.

17 MR. SPRENGEL: Right, so subsequently,  
18 this evaluation has been completed and provided to the  
19 staff. I think we'll take that as an action to provide  
20 that reference.

21 MEMBER BLEY: So this isn't a design issue.  
22 Somehow it's a PRA issue. Is that what you're saying?

23 CHAIRMAN STETKAR: Chapter 19 is severe  
24 accidents.

25 MEMBER BLEY: That's true.

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1 CHAIRMAN STETKAR: So by definition it's  
2 not a design basis issue.

3 MEMBER BLEY: Fair enough.

4 CHAIRMAN STETKAR: So they dump all of that  
5 into Chapter 19, so that's why it's addressed in Chapter  
6 19. It's not a PRA in a sense. Chapter 19 covers severe  
7 accident issues. So design features that are strictly  
8 associated with severe accidents are covered in Chapter  
9 19.

10 MEMBER BANERJEE: What's the logic? They  
11 must select certain sequences to guard against  
12 something, right?

13 CHAIRMAN STETKAR: In principle, the RAI  
14 response addresses that, I guess.

15 MEMBER BROWN: The DCD talks about being  
16 distributed to these 20 within not only the main  
17 containment, but within the subcompartments as well  
18 which there's no discussion what's the level of  
19 isolation between them and therefore how many are left  
20 or how the selection is. So it was over our head, I  
21 guess.

22 MS. STEINMAN: This RAI response, because  
23 it happened after the last meeting was not incorporated  
24 into the version of the DCD that you are reviewing right  
25 now.

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1 MEMBER BLEY: Is the implication of this  
2 you could pull out nine of the igniters from your design?

3 Is there any other requirement that has them in there?

4 I mean you're only protecting 11 of them against the  
5 cases where you might conceivably want them.

6 MS. STEINMAN: And the 11 would be the  
7 minimum number that you need to address the particular  
8 conditions that were evaluated.

9 MR. SPRENGEL: Right, this is a specific  
10 Chapter 19 scenario that we're talking about for the  
11 minimum 11, and it is tied to identifying the battery  
12 power needed. So I'm going to maintain the action to  
13 get the reference so that we can all be speaking to the  
14 same point. And this is completely removed from like  
15 the Chapter 6 perspective.

16 MEMBER BLEY: That's good. We'll pick  
17 that up later. My question is are there any other  
18 accidents for which those other nine do you any good  
19 at all?

20 MR. SPRENGEL: And I am going to delay, I  
21 have a guess on that, but I'm going to delay giving a  
22 specific answer and get the appropriate material for  
23 you.

24 MEMBER BLEY: Good.

25 MEMBER BANERJEE: So just as a question

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1 following up a little bit on this, I imagine that these  
2 are distributed, these 20 into the open volume and some  
3 subcompartments, right?

4 MEMBER BROWN: Yes, they call that out.  
5 They don't say exactly what even in the DCD. They don't  
6 call out a list of numbers at each compartment. At least  
7 I didn't find it. I looked at the figure they  
8 referenced, but I didn't 6 point something or 5.2.1 or  
9 something like that. And it was very, very -- a couple  
10 of boxes and no -- very little definition in terms of  
11 specificity as to what was what and where. So I didn't  
12 see anything that was really pressing.

13 MR. SPRENGEL: I think there's been some  
14 changes on our specificity.

15 MEMBER BROWN: That would be nice.

16 MR. SPRENGEL: I would again delay  
17 discussion on that. That was identified by the staff  
18 as well.

19 MEMBER BANERJEE: I'm just trying to  
20 understand the logic though, the logic of how you've  
21 done this is you've identified the placement and the  
22 open spaces as well as those subcompartments where in  
23 some form, based on a PRA or something, where you might  
24 get high hydrogen concentrations. Is that the logic  
25 you followed in distributing them? I'm just trying to

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1 understand how you pick the locations for these 20.

2 MR. SPRENGEL: Unfortunately, we lost our  
3 hydrogen people whenever -- they were on the phone  
4 earlier and we passed through the hydrogen and we lost  
5 them. So I can follow up on that and during this meeting  
6 we can get a response.

7 My understanding is that it is an iterative  
8 process of using MAP and GOTHIC to identify as you said  
9 I think the potential sources or higher LOCA  
10 concentration of hydrogen and then put the igniters in  
11 place.

12 MEMBER BANERJEE: And those sequences were  
13 picked from some of a PRA I would imagine, right?  
14 You'd have to know --

15 MR. SPRENGEL: The access scenarios?

16 MEMBER BANERJEE: yes, the scenarios that  
17 are used because how would you know where to put it  
18 without knowing something about the accident scenarios?

19 So did you pick the most top ten, whatever, I don't  
20 know, scenarios and then look at how to located this?

21 I'm just looking for a sequence in the logic, how you  
22 did -- went about this, you know?

23 MR. SPRENGEL: Jim Curry is on the line,  
24 if we could get the line opened up. I think we could  
25 do that, we would have a better chance of getting some

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1 answers.

2 MEMBER BANERJEE: We are looking for the  
3 design methodology for placement of these.

4 MEMBER SCHULTZ: And where it's  
5 documented, Ryan. It sounds as if there's been a  
6 communication with the staff since we last --

7 CHAIRMAN STETKAR: Quite honestly, if the  
8 answer is all of these issues are addressed in that RAI  
9 response, we can look at that once we get it. If there's  
10 some indication that they're not, then we ought to get  
11 them on the table so that we get answers to them.

12 MR. CURRY: Can anybody hear me.

13 CHAIRMAN STETKAR: Yes, thank you very  
14 much. Jim, just identify yourself for the record?

15 MR. CURRY: Yes, thank you, Mr. Chairman.  
16 This is Jim Curry, MNES. The RAI that you're talking  
17 about is 71 --

18 CHAIRMAN STETKAR: Jim, you're breaking up  
19 really badly, so either move back from your microphone  
20 --

21 MR. CURRY: Let me try moving back.

22 CHAIRMAN STETKAR: There you go.

23 MR. CURRY: The RAI that you're referring  
24 to is 8716121.

25 MEMBER REMPE: Rev 1 or Rev 0?

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1 MR. CURRY: It's a revised RAI, submitted  
2 April 25, 2013.

3 CHAIRMAN STETKAR: 2013? You're still  
4 breaking up a little bit.

5 MR. CURRY: Sorry, I'm not sure what the  
6 issue is.

7 CHAIRMAN STETKAR: It's probably on our  
8 end. I'll just alert you to the fact that you are.  
9 So we'll make sure the -- the staff, I'm sure is on top  
10 of this. We'll get the most recent revision of that  
11 RAI and get a response from the staff.

12 MR. CURRY: That's right, and I think it's  
13 the question of the logic, the location of the igniter,  
14 view of the most likely severe accident --

15 CHAIRMAN STETKAR: We lost you after "most  
16 likely severe accident" so could you repeat what you  
17 said, please?

18 MR. CURRY: Right, the logic for selecting  
19 the 11 was based on a PRA type approach of the most likely  
20 released agents, for example, the RCP seals. And it  
21 is a severe accident sequence, so this is not normal  
22 containment location of the igniters. Our view is we  
23 need all 20 to really --

24 CHAIRMAN STETKAR: We lost you again after  
25 you said "we need all 20" to do something.

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1 MR. CURRY: To thoroughly blanket the  
2 containment, but 11 are picked for this severe accident  
3 sequence.

4 MEMBER BANERJEE: Is all this explained in  
5 the RAI, then we can do without the static.

6 MR. CURRY: I believe that you will find  
7 that it's well explained in the RAI.

8 CHAIRMAN STETKAR: That's the important  
9 piece because we can't get resolution in real time during  
10 this meeting. So as long as there's some confidence  
11 that these issues are addressed, in other words, a  
12 selection of the accident sequences and justification  
13 for why you need 11 and only 11 to satisfy the  
14 requirements for those accident sequences, we'll take  
15 that information and then ask the staff to make sure  
16 that we get the most recent revision of that RAI and  
17 the response and we can do some homework.

18 MR. CURRY: That's good. Thank you, sir.

19 CHAIRMAN STETKAR: Thanks, Jim.

20 MEMBER BANERJEE: Can we get that in real  
21 time, so that we can look at it tonight in case we have  
22 some questions tomorrow?

23 MS. REYES: Of course. I just want to ask  
24 is this Chapter 19 or Chapter 6 RAI?

25 MS. STEINMAN: This was a Chapter 19 RAI.

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1 MS. REYES: That's what I thought. The  
2 slide wasn't provided.

3 CHAIRMAN STETKAR: Just make sure we will  
4 get it. And Jim, we're going to cut you off again because  
5 on our end we get all kinds of static, so you can listen  
6 in, but if you're screaming at the microphone we can't  
7 hear you.

8 MR. CURRY: Thank you. I'm communicating  
9 with Ryan, so he'll let you know if I need to talk.

10 CHAIRMAN STETKAR: Good, thanks a lot.  
11 Rebecca?

12 MS. STEINMAN: All right, the final bullet  
13 on this slide simply says that this system is  
14 automatically initiated by the ECCS actuation signal,  
15 but of course, it may be manually initiated whenever  
16 it's needed.

17 MEMBER BROWN: Before you leave that is  
18 there a basis for why you do it with ECCS signal as  
19 opposed to just being generally energized?

20 CHAIRMAN STETKAR: So they don't burn out.

21 MEMBER BROWN: It says they were  
22 automatically initiated, I just wondered why the only  
23 time is when the ECCS is actuated and if it's because  
24 keep them energized, they'll burn out, that's fine.

25 CHAIRMAN STETKAR: Kind of like why you

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1 don't keep a high head safety injection pump running  
2 constantly.

3 MEMBER BROWN: I'm not an igniter expert,  
4 so I asked the question. I thought the answer would  
5 be easily available.

6 CHAIRMAN STETKAR: Anything else on the  
7 igniters?

8 MEMBER BROWN: Okay, so there's no answer  
9 to that, is that correct?

10 MEMBER SCHULTZ: How do your igniters  
11 function?

12 MEMBER BLEY: Are they glow plugs,  
13 catalytic things?

14 MS. STEINMAN: Jim is the person who can  
15 answer that question.

16 CHAIRMAN STETKAR: He's shouting at the  
17 microphone right now. Okay.

18 MEMBER BANERJEE: I think the concern has  
19 always been wetness, so they have to be able to function  
20 under wet conditions.

21 MR. SPRENGEL: We can follow up on to the  
22 type and why they're not normally energized.

23 MS. REYES: John, we do have now the  
24 reviewer here. If the ACRS members have any questions  
25 related to this topic because he will have to leave soon.

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1 If you have any questions specifically to the staff  
2 and the staff's review, this is the time.

3 MEMBER BANERJEE: Well, could we review the  
4 RAI and will you be here tomorrow or are you taking of?

5 CHAIRMAN STETKAR: Just identify yourself.

6 MR. O'DRISCOLL: This is Jim O'Driscoll.

7 I'm with the Containment Ventilation Branch and I'll  
8 be here tomorrow. We can handle that --

9 CHAIRMAN STETKAR: It sounds like the best  
10 approach here for timeliness is if we can get the RAI  
11 response this afternoon so that we can look at it this  
12 evening and that might focus some of the questions.  
13 And Jim, if you're available tomorrow perhaps on call,  
14 we don't want you to necessarily sit here, but bring  
15 it up tomorrow.

16 MEMBER BANERJEE: But let's look at what's  
17 been submitted.

18 CHAIRMAN STETKAR: Thanks, Jim.

19 MS. STEINMAN: Moving on to the next slide.

20 It simply states there are no open items for DCD Section  
21 6.2.5 which is related to the combustible gas control.

22 Our next topic is containment leakage  
23 testing. The requirements are provided in 10 CFR 50  
24 of Appendix A, GDC items 52, 53, and 54 and they require  
25 that the reactor containment vessel and the piping

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1 systems that penetrate the containment be designed to  
2 accommodate periodic leakage rate testing.

3 Appendix J specifies the leakage testing  
4 requirements for the containment, its penetrations, and  
5 the isolation valves. This is Type A, B, and C tests.

6 The US-APWR leakage rate testing program  
7 implements the performance-based leakage testing  
8 requirements of 10 CFR 50 Appendix J, Option B using  
9 the specific methods and guidance provided in NEI 94-01  
10 and ANSI/ANS-56.8-1994, as modified and endorsed by RG  
11 1.163.

12 There are currently no open items related  
13 to this section of the DCD either.

14 The next topic is the fracture prevention  
15 of containment pressure vessel. The ferritic  
16 containment pressure boundary materials include the  
17 ferritic portions of the containment vessel; all  
18 penetration assemblies or appurtenances that are  
19 attached to the containment vessel, all piping, pipes,  
20 and valves that are attached to the containment vessel  
21 or penetration assemblies out to and including the  
22 pressure boundary materials of any valve required to  
23 isolate the system and provide a pressure boundary for  
24 the containment function.

25 The ferritic pressure boundary materials

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1 meet the fracture toughness criteria and the  
2 requirements for testing that are identified in Article  
3 NE-2000 of Section III of Division 1 or Article CC-2000  
4 of Section III, Division 2 of the ASME Code.

5 There are no open items associated with this  
6 section of the DCD either.

7 Next up we have the Emergency Core Cooling  
8 System. This slide provides a brief overview of the  
9 different subsections of the DCD, Section 6.3 for ECCS  
10 design and evaluation.

11 The Emergency Core Cooling System is  
12 designed to remove heat from the reactor core following  
13 a postulated design basis accident. The ECCS consists  
14 of the safety injection system which includes the  
15 accumulator, the high head injection, and the emergency  
16 letdown system.

17 The primary function of the ECCS is to  
18 remove stored and fission product decay heat from the  
19 reactor core following an accident. The safety  
20 injection function of the ECCS ensures adequate coolant  
21 availability to perform this function. The primary  
22 function of the ECCS with respect to safe shutdown is  
23 to ensure a means for feed and bleed for evaporation and  
24 make up water for compensation of shrinkage. Certain  
25 portions of the ECCS operate in conjunction with other

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1 systems to ensure that safe shutdown is maintained.

2 With respect to containment pH control,  
3 sodium tetraborate baskets are located in containment  
4 and are capable of adjusting the pH of the recirculation  
5 water to at least 7 to enhance the iodine retention  
6 capacity and to avoid stress corrosion cracking of the  
7 austenitic stainless steel components that are located  
8 in containment.

9 The ECCS design features include four  
10 independent and dedicated 50 percent capacity SI pump  
11 drains and four passive accumulators with one supplying  
12 each reactor coolant cold leg. The US-APWR employs  
13 direct vessel injection from the SI pumps via the nozzles  
14 connected to the reactor vessel in the reactor cavities  
15 of the compartment. The RWSP is located inside  
16 containment, thus eliminating the need to switch over  
17 the ECCS section from an external source to the  
18 containment recirculation sump.

19 The emergency letdown system provides  
20 redundancy to the normal CVCS system for achieving cold  
21 shutdown operation conditions. And as previously  
22 discussed, NaTB is provided for post-accident pH  
23 control.

24 CHAIRMAN STETKAR: Now I'm going to ask my  
25 NaTB question unless you tell me it's pertinent

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1 someplace else. In the -- we discussed this, I think,  
2 once before, but I wanted to bring it up now because  
3 the analyses that I've seen and in Section 6.3.2.2.5  
4 of the DCD indicate that it takes about -- it takes  
5 approximately 12 hours to dissolve the NaTB.

6 We raised a question during some earlier  
7 meeting about operator actions to prematurely terminate  
8 containment spray because normally the emergency  
9 operating procedures instruct the operators to  
10 terminate containment spray when containment pressure  
11 gets down to normal or within some range.

12 That would occur obviously well before 12 hours for any  
13 event that I can think of. And the response we got at  
14 the time is well MHI indicated that the EOPs would be  
15 revised to instruct the operators to maintain  
16 containment spray flow for long enough to ensure that  
17 the NaTB is dissolved.

18 My question is how do the operators now know  
19 when they should shutoff containment spray flow? I mean  
20 you don't have a pH monitor. The 12 hours seems to be  
21 some sort of -- it's probably a calculated value on the  
22 presumption of 2 and only 2 containment spray trains  
23 operating which is the design basis analysis.

24 My question is how do the operators at this  
25 plant know how long they should run containment spray

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1 to satisfy everything, containment pressure response,  
2 adequate dissolution of all of the NaTB to make sure  
3 that I've got the right pH in the RWSP and so forth?  
4

5 I realize it's an operational question, but  
6 we are concerned here about guidance to the operators  
7 under stressful conditions.

8 MR. SPRENGEL: I understand. The first  
9 thing, we don't have EOPs developed for this plant.  
10 So I think there were some discussions about the guidance  
11 documents that will be provided for creating the EOPs,  
12 but your question still definitely remains.

13 For the record, I want to be clear though

14 --

15 CHAIRMAN STETKAR: Recognizing that the  
16 COLA, the COL, the eventual licensee develops the  
17 procedures themselves.

18 MR. SPRENGEL: Beyond that though, I'm  
19 going to have to take that away and follow up on it.

20 CHAIRMAN STETKAR: Okay, I just want to  
21 make sure that whatever guidance is developed by the  
22 designer of this plant and you're right, I'm not correct  
23 to call that EOPs, but you do supply the guidance  
24 document and the background information for all of this,  
25 the eventual development, pretty clearly addresses this

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1 issue because we danced around it a couple of times and  
2 in -- the reason I brought it up again in DCD 6.2.2.2.2,  
3 it says explicitly following a design basis accident  
4 containment pressure approaches atmospheric pressure.

5 When the containment pressure is reduced sufficiently  
6 and the operator determines that containment spray is  
7 no longer required, the operator terminates containment  
8 spray. The operator closes containment spray header  
9 isolation valves, does other things.

10 My question is how does the operator  
11 determine when containment spray flow is no longer  
12 required, because it's not only pressure.

13 MR. SPRENGEL: I agree.

14 CHAIRMAN STETKAR: Thank you.

15 MS. STEINMAN: Next slide, please. So the  
16 slide currently showing on the screen provides an  
17 overview of the four independent trains at ECCS which  
18 include the four vertically-mounted cylindrical  
19 accumulators located outside each SG reactor coolant  
20 pump cubicle and those are shown at the top of the slide.

21 Four safety injection pumps that take  
22 suction from the in-containment RWSP and directly inject  
23 into the vessel via the nozzle connections that are  
24 located in the reactor cavity. Two emergency letdown  
25 lines that direct reactor coolant to the spargers in

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1 the RWSP. The emergency letdown lines are provided --  
2 the two of them are provided one from each hotleg for  
3 leg A and leg D.

4 The in-containment refueling water storage  
5 pit or RWSP --

6 CHAIRMAN STETKAR: Before you -- if you go  
7 back there, this unfortunately, I was searching for the  
8 drawing, but I'll just refer to it, the safety injection  
9 system and there were RAIs about this, but I'm still  
10 a bit confused. Figure 6.3-3 in the DCD shows the safety  
11 injection system piping elevations. And the piping has  
12 a high point inside the containment, I think as best  
13 as I can tell. If I can -- bear with me a moment so  
14 that I actually -- pull up the drawing I can tell you  
15 where it is and I might be wrong.

16 (Pause.)

17 The drawing 6.3-3 shows what seems to be  
18 a high point between the outside containment there's  
19 motor operated isolation valve that's normally opened.

20 Then inside containment, there's a check valve and  
21 another motor operated isolation valve. Between the  
22 check valve and the in-containment motor operated  
23 isolation valve, there's a high point and it's pretty  
24 clearly shown on this drawing.

25 From that high point, there's a takeoff for

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1 the safety injection pump test line. My concern is  
2 accumulation of gas and the staff did, in fact, have  
3 several RAIs regarding this topic. There's in the SER,  
4 it refers to the response to an RAI 464-3520, Question  
5 05.04.07-11 that apparently addressed venting. And it  
6 mentions a technical specification surveillance  
7 requirement 3.5.2.7 that was added to verify that ECCS  
8 location susceptible to gas accumulation are  
9 sufficiently filled with water. It says "in addition  
10 this area, susceptible to gas accumulation, is  
11 dynamically swept quarterly to the RWSP by the  
12 in-service testing program."

13 Now I looked at the in-service testing  
14 program and the in-service testing program seems to say  
15 that the pumps are tested either with the pump minimal  
16 flow or full flow piping, loops. So I have questions.

17 What confidence to I have that quarterly testing  
18 through, for example, the minimum flow line will sweep  
19 accumulated gases out of this piping? There are  
20 requirements to say the system is vented prior to plant  
21 startup. That's fine, I can do that. This is inside  
22 the containment, so it's not readily accessible during  
23 plant operation. During plant operation, I might have  
24 maintenance events. I might have all kinds of things  
25 that can introduce gas into this line outside

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1 containment. And because this is the high point in the  
2 system, that gas is going to migrate there. Those  
3 valves are normally open.

4 So the question is what analyses have been  
5 done to give me confidence that this quarterly operation  
6 through what might be the minimum flow line, might be  
7 the full flow line, I'm not sure which because it doesn't  
8 seem to specify will adequately give me assurance that  
9 that piping section is vented? I was going to ask a  
10 design question. I don't know why that high point is  
11 located where it's located at the one point that I  
12 probably can't get to to periodically vent it, but given  
13 the fact that that's the design and somebody made that  
14 decision, I'd like some confidence about the ability  
15 to provide assurance that it's vented.

16 MS. STEINMAN: I believe there's an  
17 on-going side discussion over here and they will have  
18 the answer in just one moment.

19 (Pause.)

20 CHAIRMAN STETKAR: As usual, by the way,  
21 if we can't get something really quick, we can -- we  
22 still have a day and a half.

23 (Pause.)

24 MS. STEINMAN: There's not a specific  
25 analysis. This is -- the figure that you're referencing

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1 doesn't show the detail of that line.

2 CHAIRMAN STETKAR: That's exactly right.

3 MR. SPRENGEL: So the line itself is  
4 inclined to collect the gases at the high point so that  
5 when you do flush it out, it's not kind of bubbles that  
6 are throughout it, it's actually collected at the high  
7 point of that line.

8 CHAIRMAN STETKAR: Okay.

9 MR. HAMAMOTO: This is Hiroshi Hamamoto  
10 from MHI. Basically, pump discharge line is sloped to  
11 the high point. We jumped the discharge lines. That is  
12 our engineering judgment.

13 CHAIRMAN STETKAR: Okay, well, engineering  
14 judgment is one thing. Confidence that indeed gas will  
15 go where you want it to go and not stay where you don't  
16 want it to stay is something else.

17 Could we -- if, for example, you're right,  
18 it only shows that the test line comes off what is clearly  
19 indicated as the high point in the system. What I'd  
20 like is a little bit better information that indeed any  
21 gas that's introduced into that discharge line is  
22 somehow -- I hate to use the term guaranteed, because  
23 nothing is guaranteed, but what is the basis for high  
24 confidence that indeed the gas will collect in the  
25 location that will be swept out when I perform that test?

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1 So it's not only the configuration of the discharge  
2 line itself, it's also the configuration of the test  
3 line and the amount of flow that's put through that test  
4 line. You wouldn't want the test line to come off the  
5 bottom of the pipe for example.

6 MR. SPRENGEL: Is the question on  
7 collecting the gas or discharging it?

8 CHAIRMAN STETKAR: It's primarily  
9 discharging it from my perspective. You're effectively  
10 taking credit for a periodic test of the system to give  
11 you assurance that any collected gas will be swept out  
12 of the system. So part of it is the collection part  
13 that indeed the gas will collect at the location you  
14 expect it to collect and no other place. And then the  
15 secondary part is the assurance that the periodic test  
16 will effectively sweep that gas out of the system and  
17 discharge it back into the RWSP. So I'm not quite sure  
18 that it's as distinct as collection versus sweeping,  
19 but it's really both of those issues.

20 MR. HAMAMOTO: We already discussed about  
21 discuss about some possibility portion in RAI.

22 CHAIRMAN STETKAR: Okay, maybe if it's that  
23 RAI that I cited, maybe we can get a copy of that from  
24 the staff who has disappeared. Just make a note of it.

25 It's RAI -- unless there's an additional one, the one

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1 that I found was RAI 464-3520, in particular question  
2 05.04.07-11. That's what was referred to in the SER.

3 If there's additional information in another RAI  
4 response, I'd appreciate the information. We can make  
5 sure we get that particular RAI from the staff and that  
6 will give us an opportunity to read a little more  
7 details. Okay. Thank you.

8 MEMBER REMPE: John, while you're writing  
9 your notes, just to briefly go back to this hydrogen  
10 issue, again, it's been a while and I've forgotten  
11 things, but I found the ERI report and they did do some  
12 more conservative calculations. There were  
13 interactions between them and the licensee.

14 Sanjoy, there was an ERI report about the  
15 hydrogen issues in mixing and Khatib Rhabar was here  
16 when we had this discussion and he had actually used  
17 an ERI-specific code to look at ignition. He had  
18 identified ways to further enhance the amount of  
19 hydrogen produced beyond what was in MELCOR or MAP by  
20 considering steel of oxidation along with the zircaloy  
21 oxidation. He looked at areas where hydrogen might  
22 collect and due to condensation and the refueling water  
23 storage pit. There were interactions between him and  
24 MHI where they did more refined GOTHIC analyses and at  
25 the end of the day everybody concluded that it was a

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1 very low potential for ignition to occur.

2 I can send you -- I think that report might  
3 actually be very helpful in your deciding whether any  
4 further activity needs to occur in this area.

5 MEMBER BANERJEE: This is the ERI report?

6 MEMBER REMPE: I found it much more useful  
7 than the documentation that was provided to us. We  
8 actually had to ask the staff for it to get it. It's  
9 proprietary so I'm just going to give you on a jump drive.  
10 But I'll get it to you today.

11 MEMBER BANERJEE: All right. Good, thank  
12 you.

13 MEMBER REMPE: I had forgotten, so I had  
14 to look up and find the report.

15 MEMBER BANERJEE: You and Mike were here  
16 for the --

17 MEMBER REMPE: I was here. I can't  
18 remember if Mike was here for all of it. Again, I had  
19 trouble remembering if the report was found. I had to  
20 dig through. Bill Shack was here with me. I do know  
21 that.

22 MEMBER BANERJEE: You did your due  
23 diligence.

24 MEMBER REMPE: We tried, but we're never  
25 as diligent as you are.

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1 (Laughter.)

2 MEMBER BANERJEE: Thanks.

3 MS. STEINMAN: The slide we have up is  
4 related to the in-containment refueling water storage  
5 pit that is located at the elevation of 3 foot 7 inches  
6 and the lowest part of the containment. This area  
7 provides the continuous suction source for those safety  
8 injection and containment spray RHR pumps. As stated  
9 previously, this configuration allows for the  
10 elimination of the suction switchover of the US-APWR.

11 The lefthand figure on the bottom of this slide provides  
12 a plain view of the RWSP which is shaded blue. The RWSP  
13 is a horseshoe-shaped box around the perimeter of the  
14 containment with the open end facing plant north. The  
15 lefthand figure shows a section view of the RWSP.

16 MEMBER BANERJEE: Where does the  
17 recirculation pumps draw from?

18 CHAIRMAN STETKAR: If you use the mouse,  
19 it's a little bit easier.

20 MS. STEINMAN: There you go. So these are  
21 the strainers.

22 MEMBER BANERJEE: Okay, so what happens to  
23 the water? Does no water get below -- if you take a  
24 smaller view? I'll show you what I mean. So there's  
25 this sort of cavity below the reactor and all that region

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1 there. Is there any water that accumulates around the  
2 bottom of the containment there?

3 MS. STEINMAN: Yes.

4 MEMBER BANERJEE: So that water gets out  
5 of circulation then?

6 MS. STEINMAN: Yes. There is an  
7 ineffective pool in that area.

8 MEMBER BANERJEE: Okay, so a certain amount  
9 of water.

10 MS. STEINMAN: There is a certain amount,  
11 yes. And the specific volume of that amount of water  
12 will be described in the GSI-191 meeting.

13 CHAIRMAN STETKAR: That's what I was going  
14 to ask. We'll talk about all of what you call hold-up  
15 volumes.

16 MS. STEINMAN: Yes.

17 CHAIRMAN STETKAR: I have questions about  
18 levels in the RWSP that's appropriate for the GSI-191  
19 or is that for today?

20 MS. STEINMAN: That would be a good time  
21 to talk about that.

22 MEMBER BLEY: We haven't seen this for  
23 real. When we have a dry area in the sump area, the  
24 containment, it's really easy to inspect it to see if  
25 anything has gotten in there. What kind of facilities

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1 are provided for the plant staff to make sure that this  
2 combination sump and refueling water supply don't get  
3 debris in them during work in the containment, that sort  
4 of thing? Is the cover over very different than a --  
5 is it a grating kind of thing or what's over the top  
6 of it?

7 It seems like stuff could get in there and  
8 might be hard to spot. We can wait until the next meeting  
9 to talk about that.

10 MR. GEORGE: This is a solid concrete above  
11 it with vent pipes that have elbows on them.

12 MEMBER BLEY: So the water comes into it  
13 up through an inverted U tube essentially.

14 MS. STEINMAN: There are drain paths and  
15 there are debris interceptors associated with those  
16 drain paths and those details are also going to be  
17 included in the GSI-191.

18 MEMBER BLEY: But in general there's no  
19 easy path to get in there for stuff dropped during  
20 maintenance.

21 CHAIRMAN STETKAR: I think Dr. Bley is not  
22 talking about debris from --

23 MEMBER BLEY: I'm talking about workers.

24 CHAIRMAN STETKAR: Hard hats, wrenches,  
25 Jimmy Hoffa, that type of thing.

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1 MS. STEINMAN: The RWSP does have a solid  
2 ceiling associated with it, so you know, just a random  
3 drop in containment isn't going to drop down there.  
4 And then in terms of the other areas, we have these debris  
5 interceptors so that in the case that that debris exists  
6 there and water could push it. We have accounted for  
7 that by the interceptors to prevent it from getting into  
8 the RWSP. And there are also design considerations in  
9 terms of the debris loadings that are determined for  
10 GSI-191 that takes some of that into account, but all  
11 of that will be discussed at the October 1st meeting.

12 MEMBER BLEY: I have a question coming up  
13 and half of it will be is it covered in GSI. John, we  
14 haven't done the safety analysis yet, have we?

15 CHAIRMAN STETKAR: 15, yes.

16 MEMBER BLEY: We have. Since I didn't have  
17 a picture of this thing, Sanjoy or Joy, did any of you  
18 look at the thermohydraulic calculations and see if  
19 there's any kind of suction issues following a LOCA with  
20 getting the expected flow into this since it's coming  
21 in through --

22 CHAIRMAN STETKAR: That's GSI-191. All of  
23 the --

24 MEMBER BLEY: All of that got put off to  
25 there. Good enough.

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1 CHAIRMAN STETKAR: Getting water and  
2 material, positive suction, all of that is -- it's going  
3 to be a really busy day.

4 MEMBER BANERJEE: We shouldn't plan --

5 MEMBER BLEY: An early departure.

6 CHAIRMAN STETKAR: We'll talk about that  
7 at the closeout of this meeting.

8 MS. STEINMAN: Would we like to move on to  
9 the next slide?

10 CHAIRMAN STETKAR: Yes, please.

11 MS. STEINMAN: The next slide is regarding  
12 the advanced accumulator. The accumulators are passive  
13 devices filled with boric acid water and charged with  
14 nitrogen. The accumulators discharge into the reactor  
15 coolant leg when the cold leg pressure falls below the  
16 accumulator pressure. As shown on the lower right-hand  
17 side figure, the accumulators incorporate an internal  
18 passive flow damper which functions to inject large flow  
19 to refill the reactor vessel during the first stages  
20 of injection and then reduces the flow as the accumulator  
21 water level drops. When the water level is above the  
22 top of the stand pipe, water enters the flow damper  
23 through both the inlets at the stand pipe as well as  
24 the side inlet of the flow damper and injects water with  
25 a large flow rate. When the water level drops

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1 below the top of the stand pipe, the water enters the  
2 flow damper only through the side inlet and therefore  
3 injects water with a relatively low flow rate compared  
4 to the previous flow rate.

5 As a result of the flow damper  
6 configuration, the accumulators for the US-APWR  
7 function as the low head injection system. Since the  
8 accumulator design extends the period of injection,  
9 there's more time available for SI pump start, allowing  
10 the US-APWR to adopt GTDs for emergency power.

11 The entire day tomorrow is going to be  
12 devoted to the advanced accumulators and so in the  
13 interest of time, hopefully, we can push any questions  
14 on this system off to the detailed discussion tomorrow.

15 MEMBER BANERJEE: Tomorrow, the staff will  
16 present as well, right?

17 MS. STEINMAN: Yes. MHI presents in the  
18 morning and the staff presents in the afternoon.

19 CHAIRMAN STETKAR: Rebecca, I probably  
20 missed something here. Did you have a slide or did you  
21 cover the emergency letdown?

22 MS. STEINMAN: Not in significant detail.

23 CHAIRMAN STETKAR: Okay.

24 MS. STEINMAN: The emergency letdown line  
25 was shown on Slide 44, but we didn't provide a detailed

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1 discussion.

2 CHAIRMAN STETKAR: I just had -- this is  
3 a simple question. If I look at figure 6222-1 in the  
4 DCD, Revision 3, that figure shows the emergency letdown  
5 lines originating at loop A and loop B. Section  
6 6.3.2.1.3 of the DCD and some other drawings indicate  
7 that the lines are on loop A and loop D. And the SER  
8 says that the emergency letdown lines come from loops  
9 B, boy, and D. I'm just curious where they were  
10 connected because I've got three different sets of  
11 information that told me three different places. If  
12 I were a betting person, I know what I would bet on,  
13 but --

14 MS. STEINMAN: A and D.

15 CHAIRMAN STETKAR: A and dog.

16 MS. STEINMAN: Dog, yes.

17 CHAIRMAN STETKAR: Okay, so please from  
18 your perspective, clean up the DCD in particular that  
19 Figure 6.2.2-1 because that's the only anomaly that I  
20 could find in the DCD. And the staff ought to take note  
21 of that because they got it wrong also. Thank you.

22 MS. STEINMAN: So there are two open items  
23 that we're going to discuss today associated with  
24 Section 6.3. RAI 881-6203 Question 63104, requested  
25 incorporated of the SI pump functional qualification

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1 into the ITAC associated with that system. This RAI  
2 is related to a Chapter 3 RAI, RAI 896-6269, Section  
3 3.9.6-69 which addresses the functional qualification  
4 for all pumps, not just the SI pump.

5 Based on the staff feedback to date in  
6 association with the Chapter RAI response, it appears  
7 that the particular technical issue associated with this  
8 open item is closed pending confirmation of the DCD  
9 changes.

10 RAI 982-6036, Question 6.3-111 is where the  
11 staff asked for a hydrodynamic loading evaluation of  
12 the sparger system. MHI has agreed to perform this  
13 evaluation as part of the ITAC and has revised the DCD  
14 in accordance with the RAI response. We believe that  
15 this particular issue is closed as well, once the staff  
16 has an opportunity to confirm that the DCD changes were  
17 made appropriately.

18 The following slide shows an additional  
19 four open items associated with this section of DCD that  
20 are associated with GSI-191 and these will be discussed  
21 at the meeting in a few weeks. The topics involved in  
22 these open items are the Tier 2 designation of fibrous  
23 debris amounts; the Core Inlet Blockage impact on  
24 foreign precipitation; and the debris impact on  
25 long-term core cooling.

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1 CHAIRMAN STETKAR: What I think makes sense  
2 because I know I had some questions about the main  
3 control room HVAC system, how that goes, I think it's  
4 probably best -- we're running behind schedule,  
5 obviously. I believe we have some margin built into  
6 our schedule, so I'm not too concerned about time. So  
7 I think it's probably best to break for lunch now and  
8 I'll ask the assembly whether we should reconvene at  
9 1:45 or 1, any particular preference? I'll be generous.  
10 We'll reconvene at 1 o'clock.

11 (Whereupon, at 11:47 a.m., the meeting was  
12 adjourned, to reconvene at 1:00 p.m.)  
13  
14  
15  
16  
17  
18  
19  
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22

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

24 12:59 P.M.

25 CHAIRMAN STETKAR: We are back in session.

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1 We'll pick up with Section 6.4.

2 MS. STEINMAN: Well, the slide that we  
3 currently have showing is an overview of the different  
4 subsections for DCD Section 6.4 for the habitability  
5 system design and evaluation.

6 Next slide, please.

7 The habitability systems provide two  
8 functions, to allow the operators to remain safe inside  
9 the control room to take necessary actions to manage  
10 unusual, unsafe, or abnormal plant conditions,  
11 including a LOCA, and to prevent the operator from  
12 external release of radioactive material, toxic gas,  
13 or smoke which will enable the operators to maintain  
14 control room occupation for an extended period of time.

15 Next slide, please.

16 In order to support the previously two  
17 described functions of the habitability systems, the  
18 main control room HVAC system has several modes of  
19 operation. The two emergency modes of operation are  
20 the pressurization mode which protects the main control  
21 room operators and staff during the accident conditions  
22 and the isolation mode which protects the main control  
23 room operators from external toxic gas or smoke. These  
24 two modes will be described in greater detail on the  
25 next two slides.

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1           For the rest of this slide, we can talk about  
2 the normal mode of operation for the main control room  
3 HVAC system.

4           In the normal mode of operation outside air  
5 is drawn in through either of two missile-protection  
6 grids and the tornado depressurization protection  
7 dampers. The incoming air is then directed to any two  
8 of the four 50 percent capacity and control room air  
9 handling units and one of the two 100 percent capacity  
10 main control room toilet or kitchen exhaust fans to  
11 exhaust a portion of the supplied outside air while the  
12 majority of the main control room ventilation air flow  
13 recirculates.

14           In the emergency pressurization mode of  
15 operation, automatic initiation establishes a control  
16 room envelope pressure that is higher than that pressure  
17 of the adjacent areas. A portion of the return air flow  
18 is directed to the emergency filtration units. The  
19 outside air is again drawn in through either of the two  
20 missile protection grids and the tornado  
21 depressurization dampers. Incoming air is directed to  
22 both 100 percent capacity main control room emergency  
23 filtration units and all four of the 50 percent capacity  
24 main control room air handling units.

25 The main control room smoke purge fan and the main

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1 control room toilet and kitchen exhaust fans are shut  
2 down and isolated in this mode of operation.

3 CHAIRMAN STETKAR: Rebecca, before you  
4 leave that slide, I got confused reading DCD Section  
5 9 and DCD Section 6. In Section 9, 9.4.1.1.1, it says  
6 that the emergency isolation mode -- I guess this is  
7 the next slide. I'll let you get to the next slide.

8 I'm sorry. I was trying to do three things at once  
9 and failed on two of them.

10 MS. STEINMAN: Emergency isolation mode of  
11 operation, we have established full recirculation,  
12 without any outside air. The outside air intake  
13 isolation dampers are isolated and the return air is  
14 directed to all four of the 50 percent capacity main  
15 control room air handling units. The main control room  
16 smoke purge fan and the main control room toilet and  
17 kitchen are shut down and isolated, similar to what they  
18 were in the previous operation mode.

19 The control envelope access doors are  
20 administratively controlled to prevent them from being  
21 open during this mode of operation.

22 CHAIRMAN STETKAR: Now I can ask my  
23 questions.

24 MS. STEINMAN: All right.

25 CHAIRMAN STETKAR: In Section 9.4.1.1.1 of

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1 the DCD, it indicates that the isolation mode is  
2 automatically initiated. It's also indicated as  
3 automatically initiated in Section 9.4.1.2.2.2. There  
4 seems to be indications in Section 6.4.3 that the  
5 emergency isolation mode is manually initiated. So I'm  
6 curious whether it's initiated automatically or  
7 manually. I'm hoping that this is a simple answer to  
8 a question because based on the answer to this question  
9 I may or may not have two or three other questions.

10 MR. HOTCHKISS: This is Marc Hotchkiss  
11 again. So the emergency isolation mode is initiated  
12 based on smoke detectors automatically.

13 CHAIRMAN STETKAR: Automatically.

14 MR. HOTCHKISS: On smoke detectors. And  
15 would be manually initiated for other reasons other than  
16 smoke.

17 CHAIRMAN STETKAR: But smoke is automatic?

18 MR. HOTCHKISS: Correct.

19 CHAIRMAN STETKAR: Thank you. Let me --  
20 I'm still doing two things, one of which I'm doing  
21 successfully. The other one I'm not. That explains,  
22 because I think the context in Chapter 6 was discussing  
23 possible toxic gases or other things. Automatic for  
24 smoke. Manual for others.

25 Now, I'm glad to hear that because I can

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1 ask another question now. There was a question I think  
2 the staff may have raised the question regarding the  
3 proximity of the main control room outside air intakes  
4 to the exhaust from the gas turbine generators. On  
5 every ECCS actuation signal, the gas turbine generators  
6 fire up, so you're going to get exhaust going out.

7 The question I had is if the exhaust from  
8 the gas turbine generators comes into the intake of the  
9 main control room ventilation system which ought to be  
10 then aligned for the pressurization mode as I understand  
11 it because it's an ECCS actuation, will the smoke  
12 detectors detect smoke and realign the system to the  
13 isolation mode which indeed doesn't align the -- doesn't  
14 include the filtration units. See what I mean? Is the  
15 system going to realign itself out of the pressurization  
16 mode because it detects smoke coming from the gas turbine  
17 generator exhaust? And if it's done automatically --  
18 I don't know how those signals or whether there are  
19 priorities for those signals or how it works.

20 MR. HOTCHKISS: I can't answer the  
21 question. One overrides the other. I would say the  
22 design of the intakes is such that we wouldn't expect  
23 gas turbine exhaust to be inducted into the control room  
24 through those intakes first off. Whether or not -- if  
25 it did occur whether the smoke detectors would actuate.

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1 I don't know that we've looked at that either, but I  
2 mean this is something we probably have to think through  
3 a little bit and look at the I&C to see if there's a  
4 preference to --

5 CHAIRMAN STETKAR: There's some  
6 indication, it says the minimum horizontal distance from  
7 the gas turbine exhaust to the main control room may  
8 track outside air intake is approximately 72 feet. That  
9 sounds like a long distance, but I don't know what the  
10 relative elevations are, for example, nor do I have any  
11 idea about air flow patterns or stuff like that.

12 I'd be curious, if for some reason the  
13 pressurization mode always overrides the isolation  
14 mode, then I think I'm okay. I'd appreciate some  
15 feedback on that.

16 MS. STEINMAN: All right, we can provide  
17 that feedback.

18 CHAIRMAN STETKAR: I looked. Chapter 7  
19 doesn't have this level of detail on the I&C, so I  
20 couldn't find anything there.

21 MEMBER SCHULTZ: In the Chapter 15, a draw  
22 room dose analysis is the emergency isolation mode  
23 presumed in any case?

24 MR. HOTCHKISS: I would expect that the  
25 pressurization mode would be presumed.

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1 CHAIRMAN STETKAR: The pressurization  
2 lines up the HEPA filters.

3 MEMBER SCHULTZ: That's what I expected.

4 CHAIRMAN STETKAR: The isolation mode  
5 doesn't line up the HEPA filters.

6 MEMBER SCHULTZ: That's what I expected.  
7 I just wanted to get the question answered. Thank you.

8 MS. STEINMAN: So on this slide provides  
9 a conceptual diagram of the main control room HVAC  
10 system. The red box on the right-hand side encloses  
11 the four 50 percent capacity air handling units. The  
12 box on the left-hand side denotes the two 100 percent  
13 capacity emergency filtration units which consist of  
14 the electrical heating coils, high efficiency filters,  
15 HEPA filters and charcoal absorbers.

16 The HEPA filter and the charcoal absorber  
17 are responsible for the radioactive materials. And the  
18 electrical heating coils are provided power from Class  
19 1E power supplies in order to ensure that the relative  
20 humidity is maintained below 70 percent for the purpose  
21 of ensuring the efficiency of the charcoal absorbers.

22 The high efficiency filters are installed  
23 as both a prefilter and an after filter, whereas the  
24 prefilter is used to remove the larger airborne  
25 particulates from the air stream to prevent excessive

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1 loading of the downstream HEPA filters. This diagram  
2 also shows the various isolation dampers associated with  
3 the system.

4 There are three open items associated with  
5 Section 6.4. RAI 559-4387, Question 06.04-11 is  
6 related to main control room flood protection. MHI has  
7 provided the detailed description of the leak tight  
8 doors and the stairs that are credited as part of the  
9 Chapter 19 analysis to prevent flooding of the main  
10 control room vestibules. This item is currently a  
11 confirmatory item pending the DCD changes associated  
12 with the RAI response.

13 RAI 927-6460, Question 06.04-16 is related  
14 to the air handling unit cooling coil condensation drain  
15 lines. And MHI has responded to this RAI providing the  
16 requested additional information and revised the DCD  
17 in accordance with this response.

18 And finally, RAI 955-6585, Question  
19 06.04-17, is related to the protection of the operators  
20 from chiller refrigerant leaks and MHI has responded  
21 to this RAI indicating conformance with the ASHRAE  
22 requirements and updated the DCD to clarify this  
23 conformance. As a result, MHI believes that the  
24 technical issue in this RAI has been resolved and is  
25 simply pending staff review of the response.

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1                   CHAIRMAN STETKAR:       I had one other  
2 question. In Section 6.4.1 of the DCD, there's a brief  
3 discussion about design features for buildup of carbon  
4 dioxide in the main control room. And as best as I can  
5 tell, the rationale is it's stated that the control  
6 envelope volume is approximately 140,000 cubic feet  
7 which exceeds 100,000 cubic feet. The air inside the  
8 control room envelope can support five persons for at  
9 least six days. Therefore, the CO2 buildup in the  
10 emergency isolation mode is not considered a limiting  
11 problem. In other words, it basically says that even  
12 if the control room is completely isolated, five people  
13 can sit in there and breathe for six days without having  
14 any adverse effects from CO2. Okay, I'll take that at  
15 face value. What do I know about people and CO2?

16                   However, in response to the staff RAI about  
17 possible need to use the main control room if the  
18 technical support center is not available, and I don't  
19 know what that means, but because the technical support  
20 center is only powered for nonessential power, it might  
21 not be available under a number of conditions. There's  
22 a discussion that says well, we'll take some people from  
23 the technical support center and we'll put them in  
24 another location, but there's a statement that says  
25 plant management function would be transferred to the

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1 main control room should the TSC become uninhabitable.

2 While the ultimate details of this contingency would  
3 be part of a licensee's emergency plan or beyond the  
4 scope of the standard design, MHI estimates that in terms  
5 of manpower, the plant management function would consist  
6 of three senior licensee plant management personnel and  
7 five NRC personnel.

8 Now depending on how I count bodies, I can  
9 how account for somewhere between I'm guessing 11 and  
10 13 people in the main control room if the TSC is not  
11 operable. Now the question becomes if the main control  
12 room is isolated or if it's in the pressurization mode  
13 where you're effectively relying on these normal  
14 exfiltration rates to circulate air, do we then have  
15 a concern about CO2 buildup? In other words, do I have  
16 confidence that either the 140,000 cubic feet of volume  
17 is enough to support -- I'm not quite sure about the  
18 body count, 11 to 13 people, or do I have confidence  
19 that I have enough fresh air intake given whatever  
20 assumption there is about normal exfiltration to provide  
21 enough air makeup to support that complement of people.

22 There too, I'm not sure it can be answered today.

23 MR. HOTCHKISS: I'll give you a general  
24 response. Marc Hotchkiss again. I think for the  
25 isolation mode that's related to a toxic gas event or

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1 smoke from some fire in the yard or something, so a  
2 consequent of that and having to evacuate TSE because  
3 you don't have power of the TSE is probably unlikely.

4 But looking at the pressurization --

5 CHAIRMAN STETKAR: Yes, I'm actually a  
6 little more concerned about the pressurization mode  
7 because that would be an accident kind of condition.

8 MR. HOTCHKISS: Correct. And we provide  
9 -- the design provides up to 600 or actually 1200 cubic  
10 feet per minute, but 600 feet per minute of outside,  
11 as you said, depending on exfiltration.

12 CHAIRMAN STETKAR: I was going to say,  
13 depending on exfiltration.

14 MR. HOTCHKISS: You can always create a  
15 little more exfiltration if you needed to, but --

16 (Laughter.)

17 -- so there's a large volume of air. I'm  
18 not sure that that's been analyzed.

19 CHAIRMAN STETKAR: Okay.

20 MR. HOTCHKISS: I would say there are  
21 probably options to create more fresh air intake --

22 CHAIRMAN STETKAR: I've asked this  
23 question to other people on other designs in the past  
24 and everybody has said well, we have the makeup capacity,  
25 but getting the air out, fans don't do all that well

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1 in that mode. You actually have to have a throughput.

2 MR. HOTCHKISS: Right.

3 CHAIRMAN STETKAR: And people tend to have  
4 not thought about getting the right amount of air out.

5 So I wasn't quite sure. Because I don't have any  
6 information about the exfiltration. I only know that  
7 with a nominal 1200 SCFM makeup capacity and whatever  
8 you assume for exfiltration, you can maintain the  
9 pressure differential. But I mean that could be  
10 maintained with zero exfiltration.

11 MR. HOTCHKISS: And we would test the  
12 boundary to be relatively leak tight.

13 CHAIRMAN STETKAR: Yes.

14 MR. HOTCHKISS: So in the event there were  
15 breathing problems, I would imagine you would have to  
16 establish more exfiltration through a doorway or  
17 something like that. I suppose an analysis could be  
18 done assuming as I said, maybe 12 people or something.

19 CHAIRMAN STETKAR: I was just curious  
20 because it didn't seem that the staff had probed it at  
21 all. Okay. If you have anything or you thought about  
22 it, I'd appreciate it. Thanks.

23 MS. STEINMAN: Moving on to fission product  
24 removal and control systems. We just have a brief slide  
25 here that summarizes the various subsections of the DCD

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1 6.5 fission product removal and control systems.  
2 Fission product removal systems confine fission  
3 products -- next slide. There we go.

4 Fission product removal systems confine  
5 fission products that are released from the reactor core  
6 and become airborne. The removal in the control systems  
7 are items that we have already talked about in this  
8 presentation. The main control room HVAC system which  
9 was just discussed in Section 6.4; the annulus emergency  
10 exhaust system, which was discussed as part of 6.3;  
11 containment spray, which was discussed as part of 6.2.2;  
12 and the containment vessel, which was described in terms  
13 of the construction aspects of that under Section 6.2.1.

14 There are no open items related to DCD  
15 Section 6.5.

16 This slide provides an overview of the  
17 different subsections for DCD Section 6.6 for in-service  
18 inspection of Class 2 and Class 3 components.

19 Next slide, please.

20 This section provides information on the  
21 ISI program for the ESF components to address the  
22 requirements that are outlined in 10 CFR 50.55a(g).  
23 This section includes pre-service and in-service  
24 examinations and system pressure tests.

25 DCD Section 3.2 identifies ASME Code

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1 Section 3, Class 2 and 3 components as corresponding  
2 to quality Groups B and C components.

3 The initial ISI program incorporates the  
4 latest edition and addenda of the ASME Boiler Pressure  
5 Vessel Code approved by 10 CFR 50.55a(b) 12 months before  
6 the initial fuel loading.

7 Next slide, please.

8 Section 6.6 addresses the requirements for  
9 accessibility, examination techniques and procedures,  
10 and inspection intervals, all of which are addressed  
11 in accordance with the ASME Code Section XI.

12 The COL applicant is responsible for  
13 identifying the implementation milestones for the ASME  
14 Section XI ISI program for ASME Code Section 3, Class  
15 2 and Class 3 systems, components, piping, and supports  
16 further requirements of 10 CFR 50.55.

17 And there are no open items associated with  
18 this section of the DCD either.

19 So we have come to the end of the Chapter  
20 6 presentation this morning. Today's presentation  
21 covered the key features of the US-APWR engineered  
22 safety features including the containment, the ECCS,  
23 the habitability and fission product removal and control  
24 systems.

25 The US-APWR is designed to meet the

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1 applicable codes, standards, and regulatory  
2 requirements for these systems.

3 Although there are 12 open items identified  
4 in the staff's safety evaluation, each of these items  
5 has either been closed since the SE was written,  
6 additional information has been submitted to the staff  
7 for their review in response to closure of the item or  
8 the item is simply waiting for confirmation of changes  
9 in the DCD that were previously committed in RAI  
10 responses.

11 As a result, we feel confident that there  
12 are no significant outstanding issues that cannot be  
13 adequately dealt with as part of the Phase 4 review.

14 We acknowledge that there is some areas with continued  
15 work, but we believe that the defined closure path can  
16 be found.

17 CHAIRMAN STETKAR: That's good to hear.  
18 I'm glad you're on a path to closure. Thank you. Do  
19 the remaining members here have any further questions  
20 for MHI?

21 Ryan, I'll ask you because you're staring  
22 at me and you -- do you have anything to follow up,  
23 anything that we asked this morning?

24 MR. SPRENGEL: I have a number of actions.  
25 I don't know if you wanted to run through those or trust

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1 me.

2 CHAIRMAN STETKAR: I always trust you.

3 (Laughter.)

4 You're much more organized than I am. So  
5 let's keep whatever you have on your list there. If  
6 you can get any feedback from anyone in the next 24 hours  
7 or so, you might be able to tick off some of those boxes.

8 MR. SPRENGEL: So one of them to tick off  
9 will be the question about the reduction of pressure  
10 accounting for DCD start time.

11 CHAIRMAN STETKAR: Yes.

12 MR. SPRENGEL: It is accounted for in the  
13 180 seconds.

14 CHAIRMAN STETKAR: It is accounted for in  
15 that.

16 MR. SPRENGEL: Yes.

17 CHAIRMAN STETKAR: So that 130 seconds to  
18 get the fan up to speed is basically 100 seconds to get  
19 power to the fan, plus 30 seconds to run the fan up.  
20 Okay, great. Thanks. That answers that one.

21 MR. SPRENGEL: And anything else I think  
22 we'll follow up the beginning of the morning tomorrow.

23 CHAIRMAN STETKAR: That's fine, that's  
24 great. Good. And if MHI doesn't have anything else,  
25 we'll call the staff up.

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1 (Pause.)

2 This says proprietary information on it,  
3 so I'm going to assume it's proprietary, so what we need  
4 to do is have MHI and the staff confirm that there isn't  
5 anyone in the room who is not authorized to see this  
6 and we need to close the phone.

7 MR. SHUKLA: The phone is only for the MHI  
8 people.

9 CHAIRMAN STETKAR: We just want to make  
10 sure that's the case. I had feedback from another  
11 meeting in a different month and indeed we thought there  
12 were only accepted people on the line and there weren't,  
13 so we need to be careful.

14 MR. SHUKLA: Because we have the same  
15 number.

16 CHAIRMAN STETKAR: Because we have the same  
17 number for people dialing in. So we'll just wait to  
18 make sure we've got the phones taken care of.

19 (Whereupon, the phone lines were  
20 terminated.)

21 MS. REYES: So I guess we're ready to start  
22 now?

23 CHAIRMAN STETKAR: As long as everybody  
24 here inside the room is happy, I'm happy.

25 (Whereupon, at 1:23 p.m., the meeting

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1 adjourned into closed session, and resumed in open  
2 session at 2:59 p.m.) CHAIRMAN STETKAR:  
3 Okay, we are back in session. In this session, we're  
4 going to cover Chapter 6 of the combined license  
5 application FSAR. And we'll start with Stephen  
6 Monarque from the staff.

7 MR. MONARQUE: Thank you, Chairman  
8 Stetkar. Good afternoon. I wanted to thank the  
9 committee members for giving us an opportunity to  
10 present Chapter 6, Safety Evaluation for the Comanche  
11 Peak Combined License Application.

12 As you're well aware, we've been here  
13 numerous times today in front of subcommittee and full  
14 committee and we're making progress as Phase 2 Safety  
15 Review.

16 And with that, Mr. Stetkar, I'd like to go  
17 ahead and turn it over to Luminant for their  
18 presentation. Afterwards, we'll do ours.

19 CHAIRMAN STETKAR: Okay. Thanks,  
20 Stephen. Don?

21 MR. WOODLAN: Yes, good afternoon. I'm  
22 Don Woodlan. I'm the manager of Nuclear Regulatory  
23 Affairs for Luminant and for the new build project.  
24 It's a pleasure to be here again today.

25 I'm going to turn it over to Todd Evans.

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1 Todd is going to give the presentation. A lot of people  
2 for so few pages.

3 (Laughter.)

4 Go ahead, Todd.

5 MR. EVANS: Good afternoon. I'm Todd  
6 Evans with Luminant and I'll be presenting the Chapter  
7 3 and 4 application related to -- or the Comanche Peak  
8 application related to Chapter 6.

9 We have several things to go through. An  
10 introductory slide which gives kind of an overview, a  
11 few pieces of information. One slide on license  
12 condition that's in the Safety Evaluation Report and  
13 then several slides on site-specific applications.

14 The FSAR uses incorporated by reference  
15 methodology. There are no departures from the US-APWR  
16 DCD. All COL items are addressed in the FSAR. There  
17 is one license condition which we'll cover in the next  
18 slide. And I'm happy to still report that there are  
19 no contentions before the ASLB. The ASLB is not in force  
20 at this time, so all things have been dispositioned at  
21 this point. And also for Chapter 6, there  
22 are no open items from the Safety Evaluation Report.

23 The license condition that we have deals  
24 with availability of program details for NRC inspections  
25 of the pre-service and in-service inspection programs.

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1 Luminant has no problem and agrees with the license  
2 condition. There is a little bit of discussion we have  
3 to have regarding the schedule or the timing of providing  
4 the schedule for the availability of the programs for  
5 NRC inspection. This is no different from several other  
6 license conditions that we have in some other chapters.

7 And so it's just a matter of working out -- you see  
8 in the bottom paragraph there the words in italics are  
9 kind of the differences that we need to work out and  
10 we'll be expecting to finalize that with the staff and  
11 don't expect any issues related to that.

12 CHAIRMAN STETKAR: We don't worry about  
13 those things.

14 MR. EVANS: Moving on to the site-specific  
15 aspects. As you probably noted, Section 6.0, 6.3, and  
16 6.5 are completely incorporated by reference with no  
17 departures or supplements, so we won't talk about those.

18 For the other parts of Chapter 6, the site-specific  
19 aspects are primarily COL items related to the  
20 implementation of the timing of the implementation of  
21 various programs. We'll go through each of those very  
22 briefly.

23 The first example that's in Section 6.1  
24 which deals with the coatings program and it's simply  
25 an additional sentence that we commit to have a coatings

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1 program and implement that prior to the procurement  
2 phase.

3 Section 6.2 on containment systems has a  
4 couple of additional programs that we are committed.

5 First of all, is the containment cleanliness program.

6 It meets NEI 04-07 guidelines and its associated NRC  
7 safety evaluation. Part of that is a latent debris  
8 surveys are to be conducted prior to startup and during  
9 refueling outages and that it have controls in place  
10 to ensure that RMI fiber insulation aluminum remain  
11 consistent with the design basis requirements. So  
12 those things that are required and agreed to and  
13 specified in the design cert. the program will ensure  
14 that those are maintained during the operating phase  
15 of the units.

16 MEMBER SCHULTZ: Todd, does that mean the  
17 inspections surveys will be done during each refueling  
18 outage?

19 MR. EVANS: The commitment that we -- the  
20 agreement that we have is every other refueling outage.

21 MR. WOODLAN: Which is what the NRC wrote  
22 in their safety evaluation. They felt that was adequate  
23 so we adopted that.

24 MEMBER SCHULTZ: And there's nothing  
25 associated with any connection to maintenance

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1 activities? In other words, the major refueling outage  
2 maintenance activity were in place, I would presume by  
3 a matter of programmatic issues that that would be --

4 MR. EVANS: There is. I don't remember the  
5 exact words in the FSAR, but there also are some words  
6 that go with what you're saying if there's any major  
7 significant activities and also it could trigger the  
8 surveys to be done.

9 MR. WOODLAN: And even beyond the FSAR,  
10 we're basically adopting the same procedure we use on  
11 Units 1 and 2 and those exact words are in there. In  
12 the area where there is more activity gets more attention  
13 when you do the containment closeout.

14 MEMBER SCHULTZ: Good. Thank you.

15 MR. WOODLAN: In our foreign material  
16 exclusion programs and all that.

17 MEMBER BANERJEE: Where is the fiber  
18 insulation? You mentioned fiber insulation.

19 MR. EVANS: There are some quantities of  
20 fiber insulation in containment within the zones of  
21 influence, so there is some -- very small amounts, but  
22 there are some that could --

23 MEMBER BANERJEE: What location is that?  
24 Is it --

25 MR. EVANS: It would be insulation for

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1 piping or it could be even -- it could be dirt or things  
2 that are brought into containment and maybe if the FME  
3 program is not adequate could be left behind.

4 MEMBER BANERJEE: But this is not latent,  
5 right, debris? This is actual insulation on some piping  
6 with the ZOI?

7 MR. EVANS: Yes.

8 MEMBER BANERJEE: Rather than outside. I  
9 wonder where it is.

10 MR. EVANS: John, do you know?

11 MR. WOODLAN: John Conly, do you know?

12 MR. CONLY: I am John Conly with Luminant.  
13 The fiber insulation would most likely be on valves,  
14 small equipment, but it is not in the ZOIs.

15 MEMBER BANERJEE: Yes, that's what I was  
16 asking. So it's outside the ZOI?

17 MR. WOODLAN: Yes.

18 MEMBER BANERJEE: And the aluminum, where  
19 is the aluminum?

20 MR. WOODLAN: Aluminum, where is there  
21 aluminum located inside containment?

22 MR. CONLY: I do not know.

23 MR. WOODLAN: Okay.

24 MEMBER BANERJEE: Where is the aluminum?

25 MR. SPRENGEL: I want to go back to fibrous

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1 insulation. The design does not include fibrous  
2 insulation.

3 MEMBER BANERJEE: Right.

4 MR. SPRENGEL: So there is fibrous  
5 insulation in terms of testing to simulate the latent  
6 debris. And there are margins associated in the  
7 testing, and we'll, of course, go through that in detail  
8 and break down the different quantities that were used  
9 for the testing that was completed.

10 MEMBER BANERJEE: So the answer given to  
11 us that it's on small valves and things outside of the  
12 ZOI, so you don't even have anything outside the ZOI?

13 MR. SPRENGEL: My understanding right now  
14 is we've removed all fibrous insulation inside  
15 containment.

16 MEMBER BANERJEE: All fibrous insulation.

17 MR. SPRENGEL: Now that's not to say that  
18 it wasn't included for testing to allow for margins,  
19 but --

20 MEMBER BANERJEE: But that's different,  
21 yes.

22 CHAIRMAN STETKAR: That's important. I  
23 mean we'll obviously revisit this on October 1st, but  
24 the last I had understood was that there was no fibrous  
25 insulation in the zone of influence anywhere, but there

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1 could be and was fibrous insulation in other locations  
2 because I think we asked it one time, what are those  
3 other locations.

4 MEMBER BANERJEE: Maybe that's changed  
5 since that time.

6 CHAIRMAN STETKAR: That may have changed.  
7 We had heard things like main feedwater lines and main  
8 steam lines and things like that.

9 MEMBER BANERJEE: We'll clarify this in the  
10 GSI-191. Of course, it's very important. And also,  
11 of course, where the aluminum is, how much can get  
12 submerged. I know that is very hard for you to predict  
13 that number, the aluminum particularly, but some sort  
14 of determination of that would be helpful.

15 MR. MONARQUE: Don, this is Steve Monarque.  
16 Can MHI give you an answer on aluminum?

17 MR. WOODLAN: I think they're looking right  
18 now.

19 MEMBER BANERJEE: We can hold this.

20 CHAIRMAN STETKAR: I'm not going to  
21 speculate --

22 MEMBER BANERJEE: This is something which  
23 we can take up on October 1st. It's not mission critical  
24 to answer it right now.

25 MR. WOODLAN: I think what is pertinent

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1 with respect to this bullet is that whether there is  
2 in the original design any fiber insulation or aluminum,  
3 there is a limitation on how much we can have going  
4 forward to support the testing and the design of the  
5 sumps and we are obligated periodically to confirm that  
6 we are within those limitations.

7 MEMBER BANERJEE: Yes, whatever those are  
8 set at.

9 MR. WOODLAN: Whatever they are set at.  
10 And those are in the DCD, those limitations. And we  
11 are adopting those.

12 CHAIRMAN STETKAR: This essentially is a  
13 commitment that you're not going to leave a bunch of  
14 aluminum step ladders located everywhere.

15 MR. WOODLAN: Or add a whole bunch of  
16 lagging some place. Absolutely.

17 CHAIRMAN STETKAR: Okay.

18 MR. EVANS: And similarly, we will have a  
19 containment integrated leak rate test program, defined  
20 by Tech Spec. 5.5.16 and it will be implemented prior  
21 to fuel load.

22 Moving on to Section 6.4, habitability  
23 systems, the first slide talks about dose for main  
24 control room operators. And this is simply because of  
25 the DCD is for a single-unit site, and at Comanche Peak

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1 we have a multiple-unit site, then this is a  
2 site-specific aspect that we cover that basically says  
3 that the dose to main control room operators in adjacent  
4 as well as from existing operating units is bounded by  
5 the dose of the operators from the affected unit. So  
6 that analysis that's done as part of the DCD bounds  
7 analysis would be from adjacent units.

8 Continuing on with habitability systems,  
9 all postulated releases of toxic chemicals resulted in  
10 concentrations below the IDLH which is the imminent  
11 danger to life and health. There are no procedure  
12 requirements required for operators to take protective  
13 action in response to chemical releases.  
14 Instrumentation is not required to detect and  
15 automatically isolate the control room envelope from  
16 chemical releases, but if necessary operators always  
17 have the decision capability to isolate the main control  
18 room manually as was described in the DCD presentation.

19 CHAIRMAN STETKAR: I have a few questions  
20 about this one. First of all, Section 2.2.3.1.3 of the  
21 FSAR identifies most limiting toxic gas release as a  
22 chlorine tanker truck accident on OAFM 56. And that's  
23 the most limiting one at least that was identified in  
24 that part of the FSAR. And its frequency was  
25 evaluated to be greater than  $10^{-6}$  per year so therefore

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1 you have to do something to protect against that.

2 Now one thing that -- I have several  
3 questions, but the top bullet on here up at the top says  
4 "all postulated releases of toxic chemicals resulted  
5 in concentrations below IDLH." In the SER, this again  
6 is perhaps a little bit of deviation, but in the SER  
7 in Section 6.4.4 of the SER makes reference to RAI 6158  
8 Question 06.04-15, I'm going to rattle these off so  
9 people have them in the record.

10 It says "the plot indicated that the time  
11 available for control room operator to detect a chlorine  
12 release at the odor threshold, .08 ppm, and then take  
13 protective measures before the IDLH of a main control  
14 room concentration of 10 ppm is reached is always over  
15 12 minutes. This is well over the two minutes  
16 considered by Regulatory Guide 1.78 as adequate time  
17 before the IDLH of the main control room concentration  
18 of 10 ppm is reached."

19 That to me indicates that -- I don't have  
20 this -- I haven't look at the RAI response, but that  
21 to me indicates that an IDLH of 10 ppm can be achieved.

22 It says it's reached at more than 12 minutes.

23 MEMBER BANERJEE: Within the control room.

24 CHAIRMAN STETKAR: Right. That's all we  
25 care about here. It doesn't say that an IDHL is never

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1 reached which is your top bullet there. So I'm curious  
2 about whether you can actually reach that concentration,  
3 that 10 ppm concentration.

4 MR. EVANS: I think that's a good point that  
5 we might want to take a look at it and have some dialogue  
6 with the staff on. The RAI response and the curve that  
7 it's referring to, it doesn't go out for infinity, but  
8 it goes out a good little ways and it doesn't reach 10.

9 CHAIRMAN STETKAR: It does not reach 10.

10 MR. EVANS: It's getting kind of asymptotic  
11 and --

12 CHAIRMAN STETKAR: I'd be curious. I'm  
13 actually more interested in another part of this  
14 discussion, but that first bullet caught my attention  
15 because the RAI, what's written in the SER seems to imply  
16 that sometime after 12 minutes, I don't know how much  
17 after, you're saying it might be infinitely longer than  
18 12 minutes, you would reach that 10 ppm. And they're  
19 just using in the SER, they're just saying well, 12  
20 versus 2 minutes because the Reg. Guide says that I have  
21 two minutes to avoid dying or something like that.

22 MEMBER SCHULTZ: This could be addressing  
23 postulated releases and discussion about the operator  
24 identifying and being able -- having more than ten  
25 minutes to respond to an unpostulated release might be

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1 the other way to look at the possibilities.

2 CHAIRMAN STETKAR: Yes, but one of the  
3 postulated releases is this tanker truck accident.

4 MEMBER SCHULTZ: No, I understand.

5 CHAIRMAN STETKAR: And they couldn't make  
6 that go away.

7 MR. WOODLAN: I think it has to do more with  
8 the third bullet up there in that the Regulatory Guide  
9 allows operator action if he can sense the event.

10 CHAIRMAN STETKAR: Right.

11 MR. WOODLAN: And the point is that he can  
12 use that to manually isolate and therefore you will not  
13 reach the IDLH in the control room. It could under a  
14 worse condition and ignoring the conservatisms, you  
15 reach the value.

16 MEMBER SCHULTZ: Make the top follow the  
17 conclusion.

18 CHAIRMAN STETKAR: Before I saw that top  
19 bullet, I'm actually more concerned with the second line  
20 of reasoning. You're not proposing to install any toxic  
21 gas monitors in the control room ventilation intake,  
22 is that correct?

23 MR. EVANS: That's correct.

24 CHAIRMAN STETKAR: There's no  
25 instrumentation. So I'm an operator sitting in the

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1 control room, the first indication that I have of a toxic  
2 gas release is that I start to get really uncomfortable.

3 My eyes start to water and I start to detect --

4 MR. EVANS: There's another line of defense  
5 practically before that. It's very possible that  
6 somebody outside the control room could detect or know  
7 or is aware of the tanker truck accident and our  
8 procedures would have them -- those kind of things would  
9 inform the control room --

10 CHAIRMAN STETKAR: Let me read something  
11 to you from Section 6.4.4.2 of the FSAR. It says "For  
12 Class F stability and worst case sensitivity analysis  
13 conditions of an intake height of zero meters, solar  
14 radiation at 1150 watts per meter squared, a wind speed  
15 of 6 meters per second, air and ground temperature of  
16 115 degrees Fahrenheit, and a cloud cover of zero tenths,  
17 the concentration in the MCR" -- this is from that tanker  
18 truck accident -- "reaches human detection threshold  
19 for chlorine, .08 ppm at approximately 0.25 minutes,  
20 15 seconds, and reaches the maximum concentration, 8  
21 ppm, in approximately 16 minutes."

22 So under the worst possible conditions they  
23 aren't going to have any forewarning. Now granted under  
24 not the worst possible conditions they might have  
25 forewarning.

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1 My whole point here is we are now then  
2 relying on the operators to take manual action based  
3 on their discomfort and the Reg. Guide, the wonderful  
4 Reg. Guide written by people who have never operated  
5 a power plant wearing self-contained breathing  
6 apparatus says well, they still have two minutes to put  
7 on self-contained breather apparatus and operate the  
8 power plant, even if they don't isolate the intake.  
9 Right? I'll ask the staff about this later.

10 So my question is why don't you at least  
11 put an alarm, a detector and an alarm in the intake?

12 If you're going to rely on the operators manually  
13 isolating the intake which is what you're relying on,  
14 with the only indication being their own physical  
15 discomfort?

16 MR. WOODLAN: Well, several things. First  
17 of all, you read the series of conditions it takes to  
18 actually get to that. It takes a series of worst case  
19 -- maybe not worst case, but very adverse case to get  
20 that.

21 CHAIRMAN STETKAR: I mean that's the  
22 shortest time that you evaluate it. There are multiple  
23 scenarios.

24 MR. WOODLAN: I think Todd started to  
25 mention this. In high probability, the operator

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1 sensing the smell is not going to be his first  
2 identification except maybe in those very rapid cases.

3 Between other people that are outside the building,  
4 especially the guard force, who are trained to alert  
5 the control room if anything abnormal occurs, they're  
6 probably going to smell it and notice it well ahead of  
7 time if they don't even see the accident actually occur  
8 and notify the control room that the accident has  
9 occurred. So there are paths which are much more likely  
10 that are going to notify the control room to say there's  
11 a potential event here that could affect their  
12 environment.

13 MEMBER BANERJEE: How far is this from the  
14 control room?

15 MR. WOODLAN: One point 4, 1.5 miles to the  
16 highway, to the control room.

17 MEMBER BANERJEE: Pascal F is clearly not  
18 that unusual unless you have a very unusual site.

19 MR. WOODLAN: Got you.

20 MEMBER BANERJEE: So basically is this down  
21 hill or is it up hill from the --

22 MR. WOODLAN: It's very flat.

23 (Laughter.)

24 MEMBER BANERJEE: If it's up hill, of  
25 course, it helps you a lot. Chlorine doesn't easily

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1 go up hill.

2 MR. WOODLAN: Fairly flat, maybe slightly  
3 down hill.

4 MEMBER BANERJEE: The wind speed is a  
5 little high for Pascal F, given six meters per second,  
6 but not unusual. It could happen. It's not that  
7 difficult to get those conditions.

8 MR. EVANS: The combination of the  
9 conditions, I think --

10 MEMBER BANERJEE: But Pascal F is going to  
11 give you a relatively low rate of speed. It's usually  
12 going to be sort of a partly covered sky, so it's not  
13 that difficult to hit those conditions. Actually, you  
14 can say the wind coming in your direction from there,  
15 that has to be taken into account.

16 Plus, I assume that this calculation asking  
17 the staff was done with a dense gas dispersion model,  
18 right?

19 CHAIRMAN STETKAR: That is something we can  
20 ask the staff.

21 MEMBER BANERJEE: Are you going to speak  
22 about this? Because clearly that has a large effect  
23 on the dispersion with chlorine being such a dense gas.  
24 So this is, of course, very well understood in the  
25 chemical industry, but I don't know if it is in the

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1 nuclear industry. So dense gas disposal is very, very  
2 low under these conditions.

3 The turbulence is rather low and it hugs  
4 the ground, so there's a whole set of different codes  
5 you have to use, calculations. I don't know what you  
6 guys use, but you did this work. It's not that unusual  
7 is what I'm saying, these conditions. And a mile for  
8 a tanker car is not that far. You know, they had to  
9 evacuate Mississauga in Toronto, one of the suburbs  
10 because a chlorine tanker derailed. So it happens.  
11 It's quite --

12 MR. WOODLAN: So John, I think the answer  
13 to your question, because it is a fairly low probability  
14 event, because there are multiple scenarios that the  
15 operator would be alerted. He does have the tools  
16 necessary to mitigate the event and it meets the  
17 regulatory guidance. I think the combination of items  
18 is why we chose not to install the monitor.

19 MEMBER BANERJEE: Would it be a bad idea  
20 just to put an alarm or something? It sounds not that  
21 difficult.

22 MR. EVANS: Sometimes those alarms can give  
23 you a lot of spurious alarms as well. And control room  
24 operators don't like to be distracted with spurious  
25 alarms. You've got to take that into consideration as

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1 well.

2 CHAIRMAN STETKAR: I would rather be  
3 distracted by a spurious alarm every now and then than  
4 to breathe chlorine.

5 MR. EVANS: All right. I hear what you're  
6 saying.

7 CHAIRMAN STETKAR: Okay. I don't  
8 necessarily have to agree with you, but I hear what  
9 you're saying.

10 MEMBER BANERJEE: The chlorine tanker is  
11 a mile and a half from the plant?

12 MR. WOODLAN: I don't think it's a common  
13 event, but it's always a possibility.

14 CHAIRMAN STETKAR: It's a road. It's not  
15 like gas lines that run around the plant.

16 MEMBER BLEY: There are not a lot of  
17 alternatives, I suspect.

18 MR. EVANS: Okay, moving along to Section  
19 6.6.

20 MR. WOODLAN: John, were there more  
21 questions on that part?

22 CHAIRMAN STETKAR: That's basically it.  
23 I'm going to ask the staff a bunch of things.

24 MR. WOODLAN: Okay. Go ahead, John.

25 MR. EVANS: Again, we have some programs

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1 that are being implemented by Luminant as site-specific  
2 items. And the pre-service inspection and the  
3 in-service inspection programs will be implemented  
4 prior to fuel load. And then also the augmented  
5 in-service inspection program will be implemented prior  
6 to fuel load. And that concludes our presentation,  
7 unless you want to go through the acronyms which I don't  
8 intend to.

9 CHAIRMAN STETKAR: I'm just writing some  
10 notes here. Any of the members have any other questions  
11 for Luminant? If not, thank you. Appreciate it.

12 (Pause.)

13 MR. MONARQUE: Can you hear me okay? My  
14 name is Stephen Monarque. I'm the lead project manager  
15 for the review of the combined license application and  
16 today we're going to discuss Comanche Peak Nuclear Power  
17 Plant Units 3 and 4, Safety Evaluation Chapter 6,  
18 Engineered Safety Features.

19 These are the -- introduces Ruth Reyes as  
20 the Project Manager and myself. The next page is the  
21 Technical Review Team with David Nold and Clinton Ashley  
22 among others. There's no -- I'm going to go back. There  
23 were no open items on this which is why Ruth didn't have  
24 any open items or identify any issues to bring to the  
25 attention of the subcommittee. But having said that,

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1 we await your questions on Section 6.4. With that, we  
2 conclude our presentation.

3 CHAIRMAN STETKAR: I noticed it was pretty  
4 informative. You heard my questioning of the  
5 applicant. I guess I'll now turn the attention to the  
6 staff. What I'd like to understand is why the staff  
7 feels that the site-specific design provides adequate  
8 protection for the control room operators, given the  
9 fact that it does not include either automatic closure  
10 on detection of toxic gas or any instrumentation to alert  
11 the operators to a toxic gas intake into the ventilation.

12 You're relying strictly on the discretion of the  
13 operating team based on their sensory ability to detect  
14 the intake of some sort of toxic gas. The example is  
15 chlorine, but in principle any toxic gas.

16 MR. NOLD: My name is David Nold. Earlier,  
17 you pulled a passage from the NCR that talked about the  
18 limits or the concentration of the limit control -- it  
19 sounds like it was actually going to surpass. You could  
20 interpret it would be greater than 10 parts per million.

21 I believe I pulled that passage directly from an RAI  
22 response and from all the review that I did with HABIT  
23 and ALOHA, I could never get it to exceed 10 points per  
24 million.

25 CHAIRMAN STETKAR: You could not?

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1 MR. NOLD: I could not.

2 CHAIRMAN STETKAR: Again, I'm just  
3 quoting, this is a direct quote from the SER and it does  
4 refer to that RAI response. The only thing it says is  
5 that "before the IDLH of a main control room  
6 concentration of 10 ppm is reached, is always over 12  
7 minutes." Now what I don't know is I don't have those  
8 curves. I don't have the analyses.

9 And then it goes on to say "this is well  
10 over the two minutes required by Reg. Guide 1.78" for  
11 the operators to do something manually. So it's argued  
12 that 12 minutes versus 10 minutes is a margin.

13 The implication from reading this is it  
14 might go over. Now Luminant essentially says that and  
15 I think what I hear you saying is that not only is it  
16 over 12 minutes, it's infinitely over 12 minutes, that  
17 you never quite reach 10 ppm which is fine. I'll give  
18 you that. So the operators if they stand there, aren't  
19 going to die.

20 On the other hand, the operators at  
21 concentrations well below that 10 ppm, in fact, what  
22 does it say, .08 ppm is where they start to detect things,  
23 chlorine is pretty nasty. I used to work with chlorine.  
24 It isn't the kind of thing that you like to breathe.  
25 They're going to start feeling pretty doggone

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1 uncomfortable at well below IDLH where they die. And  
2 so I'm actually less concerned about whether or not you  
3 eventually could theoretically reach the lethal  
4 concentration in the control room.

5 I'm more concerned about essentially the  
6 fact that we're relying on the discretion of the control  
7 room operators to detect the chlorine or any other toxic  
8 substance through their own senses and then decide to  
9 take the appropriate action.

10 Now as far as the Reg. Guide says well,  
11 they're allowed two minutes to put on self-contained  
12 breathing apparatus. I don't know if you've ever worn  
13 self-contained breathing apparatus. It's not all that  
14 comfortable or useful to try to operate a nuclear power  
15 plant wearing that stuff. So that's certainly  
16 something that I don't particularly like them to do.

17 In this case, they could isolate the control  
18 room ventilation intake manually. You know, after they  
19 determine that indeed that's required. What I'm asking  
20 you is why is the staff comfortable with the fact that  
21 those -- that that combination of conditions provides  
22 adequate protection?

23 When I say adequate protection, I don't mean  
24 in terms of death. I mean in terms of the operator's  
25 ability to reliably continue operation of the nuclear

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1 power plant.

2 MR. NOLD: I believe the way we -- the  
3 amount eventually was done with respect to using a lower  
4 until it became neutrally buoyant. In other words, it  
5 behaves like heavy gas initially and up to like one  
6 percent the neutrally buoyant behavior takes over. And  
7 I think that just -- when we took that approach and we  
8 also used as a habit from that new virtual source  
9 location, we came up with a worst case situation that  
10 did not exceed ten parts per million.

11 CHAIRMAN STETKAR: I don't care that it  
12 doesn't exceed ten parts per million. I don't want them  
13 to die. I just don't want them to be operating under  
14 conditions where they're really uncomfortable. I want  
15 those operators to be nice and happy and comfortable  
16 and breathing good air, not breathe good air from a  
17 bottle. So I'm -- as I said, I'm not concerned  
18 particularly about that ten ppm because it's just  
19 Luminant's first bullet on the slide kind of caught me  
20 by surprise a bit.

21 I'm more concerned about pick a number, 1  
22 ppm, well above, 12 times -- I'm sorry 120 times, is  
23 that right? Twelve times the concentration of first  
24 detection, one ppm. I think the operators would be  
25 really uncomfortable.

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1                   MEMBER BLEY:     Right and uncomfortable  
2                   isn't just uncomfortable, it means they're probably not  
3                   as effective doing their job.  They may not be making  
4                   good decisions, that sort of thing.

5                   CHAIRMAN STETKAR:   So I'm assuming that  
6                   your analyses show that the concentration could exceed  
7                   one ppm?

8                   MR. NOLD:     Yes, yes.

9                   CHAIRMAN STETKAR:   So now my question is  
10                  well, if the concentration can exceed one ppm, we're  
11                  relying on the operators to detect that by smell, by  
12                  I don't know, watering eyes, whatever, however they  
13                  detect it.  And decide to take the right actions which  
14                  I would presume would be isolating the ventilation  
15                  intake within enough time before they get really  
16                  uncomfortable.  And we're not relying on an alarm to  
17                  say more sensitivity that we detect something to alert  
18                  them to the fact that this isn't something impending  
19                  --

20                  MEMBER BLEY:     Let me ask something that  
21                  would help me in this area a little

22                  CHAIRMAN STETKAR:   Yes.

23                  MEMBER BLEY:     You quoted a bunch of stuff  
24                  earlier.  What's the concentration at which we can begin  
25                  to sniff this stuff?

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1 CHAIRMAN STETKAR: .08 ppm.

2 MEMBER BLEY: .08 ppm. What kind of  
3 instrumentation is available and what level can you  
4 start to have reliable instrumentation for chlorine?

5 MR. NOLD: I don't have the answer to that.

6  
7 MEMBER BLEY: Any of the experts on design  
8 and control habitability know about that?

9 MR. MONARQUE: Don is going to take a shot  
10 at it.

11 MR. WOODLAN: I don't know if you want to  
12 go into this or not. I do have the curve that we ran  
13 in how the chlorine values go up based on wind speed  
14 that I could probably hook up if you'd like to see that.

15 In addition, our response to this question which is  
16 quoted in the SER talks about the impacts of chlorine  
17 at various levels and the -- let me find this.

18 MEMBER BLEY: What is the RAI?

19 CHAIRMAN STETKAR: The RAI is the 6158,  
20 Question -- 6158, that's all one number. Question 06.04  
21 -- hold on a second.

22 MR. WOODLAN: Is it 15?

23 CHAIRMAN STETKAR: I'm reading 15 here, but  
24 I'm not sure whether it's 15 or 5.

25 MR. NOLD: It's down to two. That's close

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1 enough for me.

2 MR. WOODLAN: This is Don Woodlan. It's  
3 06.04-15.

4 MEMBER BLEY: I do want to look at this  
5 stuff Don just mentioned.

6 MR. WOODLAN: Just to enhance the  
7 discussion a little bit about chlorine, in our response,  
8 let me read you some words from it, "The IDHL limit for  
9 chlorine is 10 ppm and is inherently conservative since  
10 it provides significant margin for the safety of the  
11 operators. For example, the NIOSH, National Institute  
12 of Occupational Safety Health, documentation for  
13 immediate dangers to life or health concentrations for  
14 chlorine indicate the original IDHL of 30 ppm was based  
15 on" and this is in quotes "exposure to 30 ppm would cause  
16 intense coughing fits and exposure to 40 to 50 ppm for  
17 30 to 60 minutes or more may cause serious damage."  
18 So that just maybe helps.

19 CHAIRMAN STETKAR: It helps.

20 MR. WOODLAN: In understanding the impacts  
21 of chlorine and our curves when we ran -- the computer  
22 program kicks off the software, it kicks off after so  
23 long. We never -- just like the NRC staff said, we never  
24 reached 10 ppm in our runnings, but we got as high as  
25 9 ppm and it was still going up although gradually as

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1 these curves do, they were tailing off. We could not  
2 say it never reached 10 ppm, but our runs never did.

3 MEMBER BANERJEE: And what were you using  
4 for this calculation? How did you do the calculation?

5 MR. WOODLAN: I'm sorry, I couldn't hear  
6 the question.

7 MEMBER BANERJEE: How did you do the  
8 calculation?

9 MR. WOODLAN: The actual final run?

10 MEMBER BANERJEE: The run, any run.

11 MR. WOODLAN: It was based on wind speed  
12 and was it -- which code finally gave us the --

13 MEMBER BANERJEE: What was the methodology  
14 for doing the calculation?

15 MR. EVANS: This is Todd Evans. We used  
16 a combination of code referred to as ALOHA and HABIT.  
17 Offhand, I don't remember.

18 MEMBER BANERJEE: HAVIT?

19 MR. EVANS: HABIT, H-A-B-I-T.

20 MEMBER BANERJEE: HABIT.

21 CHAIRMAN STETKAR: HABIT, H-A-B-I-T.

22 MR. EVANS: The reason for the two codes  
23 was to be able to answer some questions that the staff  
24 had regarding the heavy gas and being able to model the  
25 dispersion of the chlorine gas over the distance, so

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1 one model took the analysis for a certain distance and  
2 then the other model was able to take it the rest of  
3 the distance including the height changes for the main  
4 control room intake.

5 MEMBER BANERJEE: So I assume ALOHA is your  
6 heavy gas dispersion code, right? And HABIT takes the  
7 concentration field outside the control room and changes  
8 it to what will happen inside, right? I assume. Is  
9 that true?

10 MR. EVANS: Yes.

11 MEMBER BANERJEE: Okay. And are those  
12 codes both approved by the NRC or accepted?

13 MR. NOLD: Just the HABIT code is in the  
14 Reg. Guide right now.

15 MEMBER BANERJEE: Okay. And I seem to  
16 remember vaguely in the past that we had some questions  
17 about this.

18 MEMBER BLEY: In fact, you dug into one of  
19 the codes that you said. I didn't think it was HABIT  
20 though.

21 MEMBER BANERJEE: I'm trying to remember.  
22 There was some issues we had.

23 MEMBER BLEY: It didn't model the heavy gas  
24 in the right situations, but I don't remember about  
25 HABIT.

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1 MEMBER BANERJEE: We'll have to go back in  
2 history. There was another plant --

3 MEMBER BLEY: It was within a year or two.

4 MEMBER BANERJEE: Now that we know what the  
5 codes are, we can dig back and see because there was  
6 some issues. Maybe they were false and maybe they were  
7 not. But we need to go back and look at that.

8 MR. KELLENBERGER: This is Nick  
9 Kellenberger at MNES. The genesis of the question when  
10 this was asked was specifically ACRS questions on HABIT  
11 code, not modeling, but heavy gas. And the alternative  
12 was to use ALOHA while it still acted as a heavy gas.  
13 And once it transitioned to a neutrally buoyant gas  
14 that you could model and have it correctly switch it  
15 over and model the rest of it in HABIT.

16 MEMBER BLEY: But ALOHA is not one you guys  
17 looked at?

18 MR. NOLD: We did. We did use ALOHA, just  
19 as was explained for the first half mile of the accident  
20 and we took the HABIT code.

21 MEMBER BLEY: But it's not in your  
22 guidance.

23 MR. NOLD: It's not in our guidance.

24 MEMBER BLEY: Did you review the code  
25 itself to be comfortable that it's doing what it's

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1 supposed to do?

2 MR. NOLD: Yes.

3 MEMBER BLEY: The one you're trying to  
4 remember, it was a release down below and it had to go  
5 up a hill. And I think they used habit while it was  
6 a heavy gas and trapped in this area where it didn't  
7 model things right.

8 MEMBER BANERJEE: Was that with regard to  
9 summer? I'm trying to remember, going up hill?

10 MEMBER BLEY: I'm going to have to go look  
11 it up.

12 MEMBER BANERJEE: Anyway --

13 CHAIRMAN STETKAR: Be a little careful.

14 MEMBER BANERJEE: We need to look this up,  
15 but perhaps what Dennis is saying is the real situation  
16 that we were concerned because one was using a neutral  
17 buoyancy code to go uphill and maybe that's not the case  
18 here.

19 So ALOHA is what? Is it an industry code  
20 for a heavy gas dispersion?

21 MR. KELLENBERGER: ALOHA was developed by  
22 National Oceanic and Atmospheric Administration.

23 MEMBER BANERJEE: Okay, for heavy gas  
24 dispersion. Is that what they did? Was it specifically  
25 for heavy gas?

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1 MR. McKIRGAN: Dr. Banerjee, this is John  
2 McKirgan for the staff, if I could shed a little light  
3 and maybe refresh your memory.

4 MEMBER BANERJEE: Okay.

5 MR. McKIRGAN: Certainly, it was indeed  
6 summer was the application you were thinking of. In  
7 that case, the staff did use HABIT. The licensee basis  
8 there was ALOHA and that was a long discussion we had,  
9 both with the Committee and/or the mandatory hearing,  
10 so there was a rich history in the transcripts that you  
11 could refresh yourself on. But that was the issue.

12 Certainly, the staff has endorsed HABIT.  
13 We also commonly use ALOHA. It is a heavy gas model  
14 that the staff has looked -- it's subject to continued  
15 reviewed by the staff. We're looking at it actively  
16 now. We have user need with the Office of Research  
17 that's continuing to look at that. In this case, the  
18 applicants used ALOHA as they've described to try to  
19 capture the heavy gas portion of the release.

20 MEMBER BANERJEE: Thanks. That's  
21 helpful. Because it's also helpful that you're  
22 continuing to look at ALOHA. Okay. I think you've  
23 answered my question.

24 MEMBER SCHULTZ: We talk a lot about the  
25 calculational methodologies and the results that are

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1 derived from the likelihoods and probabilities, but I  
2 wanted to go back to Dennis' comment. It seems that  
3 it would be very valuable to know what the availability  
4 and reliability is of a toxic gas monitoring system that  
5 could be of help to the operating staff.

6 What we heard from the designer this morning  
7 really impressed me with respect to the facility that  
8 has been designed to protect the control room operators  
9 from toxic gas and smoke and radioactivity in the event  
10 of a severe accident. It's a very robust control room  
11 ventilation system design. And this is a missing piece  
12 that John has brought up that talks of gas monitoring  
13 in the event of something happening, whatever that  
14 something is.

15 I think it would be certainly worthwhile  
16 for the design team to look at availability of a toxic  
17 gas monitor that would be reliable and just determine  
18 whether it is something that might be added to the design  
19 to take care of this issue.

20 MR. MONARQUE: We will take that under  
21 advisement for consideration.

22 MEMBER SCHULTZ: Thank you.

23 CHAIRMAN STETKAR: Do any of the members  
24 have any other questions for the staff? If not, --

25 MR. MONARQUE: I think we have some action

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1 items regarding our presentation. You wanted the  
2 amount of aluminum in the containment. That was  
3 something MHI --

4 MEMBER BANERJEE: Where it was. That can  
5 be deferred to the GSI meeting. That's only a week and  
6 a half away.

7 MR. MONARQUE: And also we need to get  
8 back to you regarding availability/reliability of  
9 monitoring of toxic gas.

10 CHAIRMAN STETKAR: It is essentially  
11 what's the state of the practice or state of whatever  
12 you want to call it. What can you go out and buy in  
13 terms of something -- the sensitivity of something.

14 MEMBER BLEY: One of the reasons I asked  
15 that I was helping a petrochemical place and for a lot  
16 of things they had the human nose was a couple orders  
17 of magnitude better than any instrument you could buy.  
18 They actually employed the neighbors as helping staff.

19 CHAIRMAN STETKAR: You hear about -- I  
20 don't know anything about chemicals. I know what people  
21 are proposing so-called incipient detectors for smoke,  
22 and they claim that those are much, much better than  
23 the human nose. But I don't know about the chemical  
24 issue.

25 Well, if there are no other questions for

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1 the staff, thank you very much.

2 What I'd like to do now is a couple of  
3 administrative things. First of all, are there any  
4 members of the public or anyone in the room who would  
5 like to make a comment on anything that's been covered  
6 today? If not, what I'd like to then do is open up the  
7 bridge line, Girija, and see if there's anyone out there  
8 listening in who would like to make a comment.

9 It always takes a couple of minutes to do  
10 this.

11 (Pause.)

12 CHAIRMAN STETKAR: We will open up the line  
13 as soon as Theron gets back so that we can do that.  
14 In the interim, as we always do, I'd like to go around  
15 the table and see if any of the members have any final  
16 closing comments. And I'll start with the good Dr.  
17 Banerjee?

18 MEMBER BANERJEE: I think whatever  
19 comments I had I tended to make during the discussion  
20 we had. There's nothing that leaps out needing special  
21 attention to me at the moment, which we won't handle  
22 at a later time. That's really the issue.

23 CHAIRMAN STETKAR: Dennis?

24 MEMBER BLEY: Nothing.

25 CHAIRMAN STETKAR: Steve?

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1 MEMBER SCHULTZ: Nothing more.

2 CHAIRMAN STETKAR: Mike?

3 MEMBER RYAN: Nothing more, thank you.

4 CHAIRMAN STETKAR: Charlie? Well, I don't  
5 have anything more, so before --

6 MEMBER BROWN: On the 11 vice 20 igniters,  
7 did that get discussed? I had to leave.

8 CHAIRMAN STETKAR: No.

9 MEMBER BROWN: Okay, that's fine.

10 CHAIRMAN STETKAR: There is an RAI response  
11 and we do have the RAI on our CD.

12 MEMBER BANERJEE: I've looked at it once.  
13 I'll look at it tonight.

14 CHAIRMAN STETKAR: The RAI is on our CD and  
15 Charlie, for your reference I think that's 871-6121,  
16 Rev. 0. 871-6121. And it's on the CD that we got.

17 MEMBER BROWN: I think I've got that.

18 MEMBER BANERJEE: The only issue that could  
19 be that there's a sketch showing where the igniters are,  
20 but I'm not sure -- there are a couple of sketches that  
21 they actually show the elevation and the location and  
22 we might need that information.

23 MEMBER BLEY: Did we ever ask today what  
24 -- if we were right, that there were no igniters in the  
25 dome?

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1 MEMBER BANERJEE: Well, at least the sketch  
2 indicates there doesn't seem to be, but we don't know  
3 that.

4 MEMBER BLEY: I thought I'd raise that  
5 since they're still here.

6 CHAIRMAN STETKAR: Dr. Bley, do you have  
7 a question?

8 MEMBER BLEY: Actually, I do.

9 (Laughter.)

10 CHAIRMAN STETKAR: Could you ask that  
11 question now?

12 MEMBER BANERJEE: If you look at this,  
13 Dennis, it doesn't look like it has.

14 MEMBER BLEY: I know, but it's not the  
15 world's best engineering drawing copy.

16 MR. SPRENGEL: The question about the 11  
17 I think we pointed to the RAI for evaluation and we'll  
18 follow up on that. The basic answer was that it was  
19 most likely locations for beyond design basis event.

20 And so now the --

21 MEMBER BLEY: We looked at the RAI and it  
22 didn't look like you have any igniters in the dome.

23 MEMBER BANERJEE: The sketch didn't  
24 indicate that.

25 CHAIRMAN STETKAR: So I guess the basic

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1 question is are there any hydrogen igniters at the top  
2 of the containment dome?

3 MEMBER BLEY: And if not, why is that  
4 reasonable?

5 CHAIRMAN STETKAR: If you don't know,  
6 perhaps we could get that answer tomorrow morning  
7 because it sounds like a statement of fact that should  
8 be pretty easy to find.

9 MEMBER BANERJEE: In more general terms the  
10 sketch is indicative of where the igniters are. Really,  
11 we don't have the elevations and a little bit more detail  
12 would be helpful. So in the RAI page 2.11.52 you show  
13 the location, but it's not clear exactly where these  
14 are.

15 And there is another sketch which shows it  
16 relative to the take-off, which is 6.2383 and it  
17 indicates, at least in the sketch, that all the igniters  
18 are below the level of the draw-off for the hydrogen  
19 monitor and radiation monitoring system. It's all  
20 sketches, so it's not clear which.

21 CHAIRMAN STETKAR: We have that. I'm  
22 still waiting.

23 MEMBER BLEY: We can just ask them to send  
24 an email or something.

25 CHAIRMAN STETKAR: Well, no. You know, in

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1 fairness to anyone who is out there.

2 MEMBER BANERJEE: John, related to this  
3 tomorrow, we need to go through this RAI carefully.

4 CHAIRMAN STETKAR: Sure. For the purposes  
5 of this afternoon, I'm still waiting to see if I can  
6 get the bridge line opened up in case there is anyone  
7 listening in who might not be available tomorrow who  
8 might want to ask -- have comments or something. We  
9 can at least give them that opportunity. I'm not going  
10 to close the meeting until I can get that done.

11 MEMBER BLEY: It could be a sparse table.

12 CHAIRMAN STETKAR: It could be a sparse  
13 table. That's okay.

14 MS. REYES: John, Ruth Reyes, just for  
15 logistics I'm trying to engage the reviewer for the RAI  
16 related to igniters. Do you want to have this  
17 discussion tomorrow morning, correct?

18 CHAIRMAN STETKAR: Yes, because of other  
19 constraints, as -- I know we're -- on paper, the agenda  
20 shows us going all day.

21 MS. REYES: Yes.

22 CHAIRMAN STETKAR: There are some other  
23 meetings going on tomorrow afternoon that -- members  
24 have conflicts in. So as much as we can finish in the  
25 morning, I'd like to do that. And typically, what we

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1 try to do just to maintain kind of continuity of thought,  
2 perhaps we should address that first thing in the morning  
3 before we get into the accumulator. So for logistics,  
4 I guess have them available.

5 MEMBER BANERJEE: There's also the ERIN  
6 report which I brought.

7 CHAIRMAN STETKAR: E-R-I. Not ERIN.

8 MEMBER BANERJEE: Which is on hydrogen  
9 mixing things. The question is related to that.

10 CHAIRMAN STETKAR: Hearing the popping and  
11 noise -- if there's anyone out there, just do us a favor,  
12 if you're listening in and say something so that we can  
13 confirm that the bridge is indeed open in this direction?

14 Anyone? Not hearing any responses, I'm assuming that  
15 everyone has dropped off the line.

16 With that, I'd like to again thank the  
17 staff, thank MHI, MNES, Luminant, everyone for a very  
18 useful day. We got done early and we are adjourned.

19 (Whereupon, at 4:02 p.m., the meeting in  
20 the above-entitled matter was concluded.)  
21  
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UNITED STATES OF AMERICA  
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
(ACRS)

+ + + + +

US-APWR SUBCOMMITTEE

+ + + + +

WEDNESDAY

SEPTEMBER 18, 2013

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

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

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COMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman

SANJOY BANERJEE, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

JOY REMPE, Member

MICHAEL T. RYAN, Member

STEPHEN P. SCHULTZ, Member

DESIGNATED FEDERAL OFFICIAL:

GIRIJA SHUKLA

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

(8:30 a.m.)

CHAIRMAN STETKAR: The meeting will now come to order. This is the second day of the subcommittee meeting for the US APWR. I am John Stetkar, Chairman of the subcommittee meeting.

Members in attendance today are Sanjoy Banerjee, Dennis Bley, Steve Schultz, Mike Ryan, Charlie Brown, and Joy Rempe. And Girija Shukla is our designated federal official.

I won't read through all of the caveats and restrictions that I described yesterday apply. Please turn off your cell phones. If you have any comments, please come up to the microphones, speak with sufficient clarity and volume.

We will open today's meeting in open session because, as I understand it, MHI, and I am not sure whether the staff have some responses to items that came up yesterday that can be discussed in open session.

And then we will close the meeting. I understand there are some responses are proprietary.

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1 We will discuss those responses and then we will proceed  
2 with the topic of the advanced accumulator. So that  
3 is the way we will organize it.

4 And with that, I don't know if NRC Staff  
5 has anything that they would like to say as an  
6 introduction. If not, Ryan, or Rebecca, or someone from  
7 MHI will hit the ones that we can speak about in open  
8 session.

9 MR. SPRENGEL: Okay, good morning again.

10 As already mentioned, we have got a couple follow ups  
11 that we would like to go through and some additional  
12 information I think to hopefully resolve any times from  
13 yesterday. But at a minimum, it will add to our  
14 discussion for any future follow-up.

15 There is a number of other times that we  
16 didn't rush into any responses today and we will follow  
17 this up with a letter in typical fashion.

18 So I am going to go ahead and turn it over  
19 to our first area.

20 MR. GEORGE: I am Tom George from Zachry  
21 Nuclear Engineering, a consultant to MHI.

22 There was some discussion yesterday about  
23 various GOTHIC models that were used for different  
24 applications for this licensing application. And so

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1 we put together a table that kind of summarizes these  
2 models. On the left there, we talk about the five  
3 different models that were mentioned yesterday. The  
4 first one for containment heat pressure temperature;  
5 the next one for minimum containment pressure,  
6 sub-compartment pressure, EQ and hydrogen mixing.

7 The first three are the topics for Chapter  
8 6 of the DCD. The last two are covered in other sections  
9 of the DCD but there was some debated discussion about  
10 those.

11 So this table describes first of all the  
12 references for supporting documents, some general idea  
13 of what the noting is for each one of these things and  
14 the assumptions, basic assumptions. And these  
15 assumptions are consistent with reg guides and  
16 previously accepted methodology to provide a  
17 conservative analysis for each one of these.

18 So I don't know if we need to go through  
19 the details of all those things right now but they are  
20 there for your review and for discussion purposes.

21 We go to the next slide.

22 MEMBER BANERJEE: Just before you leave,  
23 for the hydrogen mixing I was reading a very interesting  
24 report here by ERI. And they mentioned some work that

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1 you would have done. I don't know if this was your  
2 consulting company or MHI, which seemed to have a higher  
3 utilization. I'm just looking for the numbers.

4 MR. GEORGE: Yes, I think actually there  
5 was an error in this slide. The last one should say  
6 6 x 5 x 5, a little bit higher resolution in the Z  
7 direction.

8 MEMBER BANERJEE: Let me just try to find  
9 this. Why don't you continue while I look for it?  
10 Because apparently there was a fairly fine nodalized  
11 run done using GOTHIC and it showed certain things.  
12 One was that the containment was fairly well mixed when  
13 you have the containment sprays. But they tried to  
14 nodalize around the jets and plumes. And I don't think  
15 you were successful.

16 So this ERI model does sort of a hand model  
17 of the jet dispersion, based on some correlation from  
18 Liszt's book.

19 So maybe while you go on I will find this  
20 allusion. It was in response to an RAI, evidently.  
21 All this has become history now. It is there somewhere.

22 MR. GEORGE: I am not familiar with that  
23 particular report but I will say that the noding here  
24 that is for this, even for the dome, is really not

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1 sufficient to get the details of a jet or a plume. And  
2 you would need much finer nodding to get those details.

3 MEMBER BANERJEE: They tried to. I think  
4 there was a study. I will come to it but keep going.

5 MR. GEORGE: Okay. If we go to the next  
6 slide then, it is kind of a continuation of this first  
7 slide. Again, list on the left side there of the various  
8 applications using GOTHIC for. The next column gives  
9 validation that have been done in the past to support  
10 these applications and those various acronyms refer to  
11 different test facilities that have been done. Mostly  
12 the integral test.

13 For equipment qualification and hydrogen  
14 mixing, there has been quite a bit of work done with  
15 GOTHIC, especially looking at some details for  
16 ratification and plumes. A lot of this was done more  
17 recently in TOSQAN, MISTRA, and also not mentioned  
18 there, but ongoing work with the ThAI facility in  
19 Germany.

20 MEMBER BANERJEE: What about PANDA?

21 MR. GEORGE: PANDA we have not done  
22 directly. PSI has used GOTHIC extensively for modeling  
23 those experiments and in fact uses it to help design  
24 those experiments. But we have not included that in

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1 our validation base.

2 MEMBER BANERJEE: Could you tell us what  
3 level of nodalization PSI had to use?

4 MR. GEORGE: Well they have used two and  
5 three dimensional models for the PANDA facility. I  
6 don't remember the height of that facility. It seems  
7 it is five meters or so, maybe a bit higher than that.  
8 But they will use up to 20,000 to 25,000 cells.

9 MEMBER BANERJEE: And did they use GOTHIC  
10 --

11 MR. GEORGE: Yes.

12 MEMBER BANERJEE: -- with 25,000 cells?

13 MR. GEORGE: Yes.

14 MEMBER BANERJEE: And did they try to  
15 nodalize around the plumes?

16 MR. GEORGE: Yes.

17 MEMBER BANERJEE: How successful were they  
18 in getting the results?

19 MR. GEORGE: I think overall they have been  
20 happy with the results. They have done comparisons with  
21 GOTHIC and with CFD analysis. And overall, they are  
22 happy with GOTHIC. GOTHIC has some advantages over some  
23 of the CFD because of the way it can handle the condensate  
24 and the films and the tracking of the films and so on.

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1           So there is some tradeoffs there but overall  
2 they have been very happy with GOTHIC. There are some  
3 details that they are looking at, the effects of film  
4 penetrations down into the lower containment. These  
5 are some fine details that are of interest but probably  
6 well beyond what are talking about here.

7           MEMBER BANERJEE: So do you think that the  
8 nodalization that you are referring to here would be  
9 able to resolve maybe locally high concentrations of  
10 hydrogen, which could be greater than ten percent?

11          MR. GEORGE: If the sprays are active, I  
12 think that the containment is going to be well mixed.

13          If there are no sprays and if --

14          MEMBER BANERJEE: Well, there are some  
15 scenarios without sprays, right? I mean they are  
16 referred to in this study here that I have been looking  
17 at. Or late initiation of sprays.

18          MR. GEORGE: Late initiation of sprays?

19          MEMBER BANERJEE: Uh-huh.

20          MR. GEORGE: It is a little difficult to  
21 say because if you have a hydrogen release, you are  
22 likely to have a lot of other heat sources in your  
23 containment high temperature heat sources. And those  
24 by themselves will generate some mixing.

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1           And so some of these tests where you just  
2           have a hydrogen flow by itself are of interest but it  
3           may not be really representative of an accident  
4           condition, where you have got a lot of other heat sources  
5           in the containment at the same time.

6           So overall, I would expect that there would  
7           be a fairly well mix of environment above the level of  
8           the heat sources and the hydrogen distribution. That  
9           has generally been what has been found is that you do  
10          get a plume that comes up. A plume evolves and develops  
11          but above the location of the plume, eventually you get  
12          a well-mixed environment. It does all mix well. And  
13          heat sources will contribute to that mixing as well.

14          And certainly if you have the sprays  
15          ongoing, they are a very effective mixing mechanism.

16                 MEMBER BANERJEE: But there are regions  
17          which don't mix. Right? I mean one of the regions where  
18          this study finds high concentrations of hydrogen is in  
19          the reactor cavity area, where the steam carries the  
20          hydrogen in and condenses. And you can get over ten  
21          percent. And it is pointed out that there is a  
22          detonation risk there because they are no igniters.

23                 MR. GEORGE: That is possible. I had not  
24          seen that report and looked at those details.

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1 MEMBER BANERJEE: Well, I am sure that Joy  
2 would be happy to --

3 MEMBER REMPE: Well actually, I guess I am  
4 a little puzzled perhaps in that answer. You did GOTHIC  
5 -- someone from MHI did GOTHIC analyses to interact with  
6 the folks that were looking at severe accident research  
7 and ERI and whoever was doing the GOTHIC analyses from  
8 MHI were going back and forth. And it sounds like you  
9 have two vendors or two consultants that do GOTHIC.

10 MEMBER BANERJEE: These guys used MELCOR.

11 MEMBER REMPE: The NRC used MELCOR and then  
12 they hired ERI.

13 MEMBER BANERJEE: Right.

14 MEMBER REMPE: But ERI and the NRC were  
15 interacting with someone from MHI that ran GOTHIC, who  
16 apparently is a different person, and they did  
17 additional analyses if you read this report. And I  
18 don't recall, I know it was only last February but it  
19 was a different person who was the GOTHIC expert then,  
20 I guess. And they don't interact.

21 MR. SPRENGEL: We will need to open up the  
22 phone line. We have representatives calling from MHI  
23 Japan.

24 MEMBER BANERJEE: Well we have also --

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1 MEMBER BLEY: I'll be glad to do it.

2 CHAIRMAN STETKAR: Thank you, Dr. Bley.  
3 We will get the phone line open.

4 MEMBER BANERJEE: This isn't a study in as  
5 much depth as I would like to see because they do hand  
6 calculations, which are okay for the jets and plumes.  
7 They can't do CFD because they haven't actually got  
8 down to that level.

9 But these hand calculations follow certain  
10 correlations which are used from a book by Liszt, a 1982  
11 book. Liszt is from Caltech and did a lot of work on  
12 jets.

13 However, I am not sure these are for buoyant  
14 jets. And there is a suppression of turbulence in  
15 density differences which slows down mixing. So we need  
16 to really do a due diligence to find out whether the  
17 correlations they used were applicable to just density  
18 jets. But they get fairly high concentrations in the  
19 plumes and the regions.

20 CHAIRMAN STETKAR: I think, as far as I  
21 know, the phone line is open. So if you do indeed want  
22 some input from whoever is --

23 MEMBER BANERJEE: First thing would be to  
24 read this report.

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1 CHAIRMAN STETKAR: Let's see if we have any  
2 other elaboration from whoever is on the other end of  
3 the phone line, first.

4 MR. SPRENGEL: Goda-san, are you on the  
5 line?

6 MR. GODA: Yes, I am.

7 MR. SPRENGEL: Okay, please introduce  
8 yourself and I think Joy had a specific question that  
9 was more directed towards your area in the other uses  
10 of the GOTHIC modeling.

11 MR. GODA: Yes, certainly. This is  
12 Hiroshi Goda from MHI Kobe. I am a representative for  
13 the accident.

14 MEMBER REMPE: We have been discussing this  
15 ERI report that the NRC prepared to summarize the  
16 interactions between MHI and the NRC and ERI. And the  
17 RAI of interest, it is a reference 17 in this report  
18 Sanjoy is number 480-3711, question number 19. It was  
19 dated March 2010. And apparently there was someone  
20 running GOTHIC that did some different types of  
21 nodalization than what was done on Chapter 6. Is that  
22 a good way to characterize this? And we were wondering,  
23 it is actually Sanjoy who had questions but it is  
24 becoming clear to us they were two different people

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1 running GOTHIC.

2 Were you the person who ran GOTHIC for the  
3 severe accident research?

4 MR. GODA: I'm very sorry about that. I  
5 couldn't listen to you. What kind of a document did  
6 you find? Could you state again please what the  
7 reference document?

8 MEMBER REMPE: This is all pertaining to  
9 RAI number 480-3711.

10 MR. GODA: Number 480, okay. Oh, I see.

11 MEMBER REMPE: Now I don't know if they  
12 received your consultant report.

13 MR. GODA: Okay, RAI 480. Okay.

14 CHAIRMAN STETKAR: By the way, for the  
15 record, the parties of interest are MHI and the Staff.  
16 It doesn't make any difference who did what analyses  
17 for MHI or the Staff.

18 MEMBER REMPE: Okay.

19 CHAIRMAN STETKAR: So I personally don't  
20 care whether 15 consultants did 15 separate  
21 calculations. It is the Staff and MHI sharing  
22 information on the record.

23 MEMBER REMPE: Right. Well, Sanjoy had  
24 questions about GOTHIC. It is clear the person here

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1 today is not the person not the person who did these  
2 GOTHIC calculations.

3 CHAIRMAN STETKAR: Okay.

4 MEMBER REMPE: So the question is, who did  
5 the GOTHIC calculations.

6 CHAIRMAN STETKAR: I don't care who -- all  
7 I am saying is I don't care who did it. We need to  
8 understand --

9 MEMBER REMPE: What was done.

10 CHAIRMAN STETKAR: -- what was done and the  
11 results of what was done.

12 You know if the gentleman on the other end  
13 of the phone didn't personally perform or lead a group  
14 who did the GOTHIC calculations, that doesn't matter.

15 MEMBER REMPE: But can he answer what was  
16 done, is what I am trying to say.

17 CHAIRMAN STETKAR: That is the important  
18 part.

19 MEMBER REMPE: Perhaps I didn't word it  
20 correctly. Okay.

21 CHAIRMAN STETKAR: Thank you.

22 MR. GODA: We did the GOTHIC calculation  
23 in a group. And we performed that on 480. But I'm  
24 sorry, I don't have that document here. But the men

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1 went out to perform at station blackout where do not  
2 have the power. And then we evaluated what kind of a  
3 hydrogen concentration in the RWSP, what these are  
4 affected by the ERI.

5 And then we did evaluations assuming  
6 several conditions. I remember that was done for seven  
7 cases, I think maybe. Anyway, in that case we performed  
8 when the igniters are available and not when the igniters  
9 are not available. And we identified when the igniters  
10 are not available, then we could see that the high  
11 concentration in the RWSP.

12 And then we provide that answer to the NRC  
13 and then they gave us additional RAI number for 627,  
14 I believe.

15 And then we discussed that about how to  
16 include the igniter design, especially when do we not  
17 have the power.

18 And then we concluded in RAI 871, which is  
19 the latest one for the hydrogen concentration, and we  
20 provided the DC Part B for igniters. And then igniters  
21 are powered during station blackout. And then we could  
22 avoid high concentration in the RWSP as current  
23 condition and status.

24 And also from all these analyses are

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1 performed based on the MAP calculation for the hydrogen  
2 leak and then GOTHIC for hydrogen mixing.

3 MEMBER BANERJEE: So these calculations  
4 which were produced in response to RAI 480-3711 were  
5 these additional --

6 MR. GODA: Additional, yes.

7 MEMBER BANERJEE: Yes, these were the  
8 additional calculations, right, that you are talking  
9 about?

10 MR. GODA: Yes, we did.

11 MEMBER BANERJEE: And you have final  
12 nodalization. You divided the node, the dormant to 150  
13 nodes here? Is that fair?

14 MR. GODA: That was the original node.

15 MEMBER BANERJEE: That was original. I  
16 see.

17 MR. GODA: Yes.

18 MEMBER BANERJEE: So could you clarify what  
19 the nodalization was in these? Because it was final  
20 nodalization compared to the old analysis.

21 I understand the old analysis used 30 nodes  
22 and 150 in the dome. Right?

23 MR. GODA: That's right.

24 MEMBER BANERJEE: Okay. Can you tell us

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1 what this did? Because we don't have -- at least I  
2 haven't seen this reference where your analyses are  
3 detailed.

4 MR. GODA: Those information not provided  
5 in DCD. Instead we issued a technical report number  
6 MUAP-07030. The current revision is Revision 3.

7 MEMBER BANERJEE: Okay, so this was in  
8 answer to RAI 480-3711, question 19, I take it.

9 MR. GODA: Okay.

10 MEMBER REMPE: Could you repeat the number  
11 of that MUAP real slowly?

12 MR. GODA: MUAP-07030.

13 CHAIRMAN STETKAR: You said that Revision  
14 3 is the current revision?

15 MR. GODA: Yes.

16 CHAIRMAN STETKAR: Thank you.

17 MEMBER REMPE: Thank you.

18 MR. GODA: And the document title is  
19 "US-APWR Probabilistic Risk Assessment."

20 MEMBER BANERJEE: Oh, so this is not called  
21 the "Additional Sensitivity Analysis for the DDT  
22 Potential?"

23 MR. GODA: No, it is not. It is not.

24 MEMBER BANERJEE: Okay.

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1 MR. GODA: Additional one is for -- that  
2 one is MUAP-10004.

3 MEMBER BANERJEE: So I am interested in  
4 getting this additional sensitivity analysis for the  
5 DDT potential and the mixing in the containment.

6 MR. GODA: Oh, I see. We can give you --

7 MEMBER BANERJEE: Which I guess that is the  
8 one --

9 MR. GODA: I'm sorry. I'm very sorry.

10 MEMBER BANERJEE: Was that the one in  
11 answer to question 19 in the RAI?

12 MR. GODA: Yes.

13 MEMBER BANERJEE: And is that covered in  
14 the MUAP that you just gave us the reference for?

15 MR. GODA: No, it is not. It is another  
16 document, MUAP-10004.

17 MEMBER BANERJEE: Okay, so we should  
18 probably get both. We may have them.

19 CHAIRMAN STETKAR: Well, 7030 is the PRA  
20 report. We have that.

21 MEMBER BANERJEE: We have that.

22 MEMBER REMPE: And we actually have the  
23 10004 P that was given to us. I have trouble keeping  
24 up with revs but it was given to us before. I have Rev

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1 0 and it was given to us before we did Chapter 19.

2 MEMBER BANERJEE: So we will have the March  
3 2010 answer to the RAI somewhere. Right?

4 MEMBER REMPE: It was in there. Somebody  
5 gave it to me before Chapter 19. I have got it here  
6 and I can hand it over to you.

7 MEMBER BANERJEE: So I haven't actually  
8 looked at this additional sensitivity analysis with the  
9 final nodalization. Could you just tell us what the  
10 nodalization was? Because there is an illusion that  
11 you also tried to nodalize finer near the plumes and  
12 jets.

13 MR. GODA: For that one we made some  
14 nodalization especially where the hydrogen is released  
15 during the accident. Like a LOCA event, we considered  
16 how the hydrogen is released in a LOCA break point and  
17 the plumes were upwards or downwards, sideways. Those  
18 tests we did are in this document.

19 MEMBER BANERJEE: So do you feel that you  
20 could, with the nodalization that you used, I don't know  
21 how fine it was, but were you able to capture regions  
22 of local high concentration in the plumes before they  
23 entrained more air around them?

24 MR. GODA: Yes, I think so.

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1 MEMBER BANERJEE: Well what about the  
2 nodalization?

3 MR. GODA: In that nodalization anyway we  
4 considered -- in our model, we provided the hydrogen  
5 igniters where the hydrogen released in the RCS break.

6 And then we evaluated even for the fine  
7 nodalization. And then we performed the effectiveness  
8 of hydrogen igniter.

9 MEMBER BANERJEE: Right. So if you had the  
10 igniter, clearly it would burn. But in regions where  
11 there were no igniters, for example in the region of  
12 the reactor cavity where steam could carry hydrogen and  
13 condense, giving you local high concentrations, how did  
14 you evaluate that?

15 MR. GODA: Well, there was --

16 MR. SPRENGEL: Goda-san, Goda-san, just  
17 one second.

18 We are in open session.

19 CHAIRMAN STETKAR: I was just going to  
20 mention that.

21 MR. SPRENGEL: Please be careful about  
22 discussing proprietary information. And if we need to  
23 close it --

24 CHAIRMAN STETKAR: We can close it.

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1 MR. SPRENGEL: -- just let us know.  
2 Goda-san, do we need to close this discussion?

3 MR. GODA: Well, personally speaking I  
4 don't care so much already.

5 CHAIRMAN STETKAR: Look, if there is any  
6 question at all, we can close -- this is a subcommittee  
7 meeting. So we have a little bit more latitude here  
8 in terms of going into closed session.

9 Well, I will ask you, Ryan, do you have  
10 anything else that we can cover in open session? I  
11 realize it is an inconvenience for the folks over in  
12 Kobe on the line. But if there is anything else that  
13 we should cover in open session -- I don't want to go  
14 to open/close/open/close. That is the only thing in  
15 terms of running the meeting.

16 MR. SPRENGEL: I think the other material  
17 that we have prepared will likely quickly go into --

18 CHAIRMAN STETKAR: Closed session?

19 MR. SPRENGEL: It is tied. It is also on  
20 hydrogen generation.

21 CHAIRMAN STETKAR: Yes, okay. I was just  
22 curious whether there was anything, any nuggets from  
23 any other --

24 MR. SPRENGEL: Oh, no.

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1                   CHAIRMAN STETKAR:   Okay, let's do that,  
2 just to avoid any drift into proprietary discussions.

3                   So what we will do is close the meeting.  
4 (Whereupon, the foregoing matter went off the record  
5 at 8:55 a.m. for a closed session.)  
6  
7  
8  
9  
10  
11  
12  
13  
14

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**Luminant**



# **LUMINANT GENERATION COMPANY**

## **Comanche Peak Nuclear Power Plant, Units 3 and 4**

### **ACRS US-APWR Subcommittee**



**FSAR Chapter 6 –  
Engineered Safety Features**

**September 17, 2013**



**Luminant**



## **Agenda**

- Introduction**
- SER License Condition**
- Site-Specific Aspects**



## **Introduction**

- ❑ FSAR uses IBR methodology**
- ❑ No departures from US-APWR DCD**
- ❑ All COL Items addressed in FSAR**
- ❑ One SER License Condition**
- ❑ No contentions pending before ASLB**



## **SER License Condition 6-1**

**SER states: No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for, and the conducting of, NRC inspections of the preservice inspection and ISI programs. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the PSI or ISI programs have been fully implemented.**

**Luminant proposed alternate words in which the LC starts out “The Licensee shall submit to the Director of NRO, a schedule, no later than 12 months after issuance of the COL *or at the start of construction as defined in 10 CFR 50.10(a), whichever is later...*” to better address a COL that does not start construction immediately. This wording to be used for all operating programs except Fitness for Duty.**

**Wording to be finalized between NRC Staff and Luminant**



## **Site-Specific Aspects**

**Sections 6.0, 6.3, and 6.5 are incorporated by reference with no departures or supplements**

### **6.1 Engineered Safety Features Materials**

**Coatings program will be implemented prior to procurement phase**





## **6.2 Containment Systems**

- Containment cleanliness program to be implemented prior to initial fuel load**
  - **Meets NEI 04-07 and its NRC safety evaluation**
  - **Latent debris surveys to be conducted prior to startup and during refueling outages**
  - **Controls ensure RMI, fiber insulation, aluminum remain consistent with the design-basis**
  
- Containment ILRT Program**
  - **Defined by Tech Spec 5.5.16**
  - **Will be implemented prior to fuel load**



## **6.4 Habitability Systems**

- Dose to MCR operators in adjacent as well as from existing operating units is bounded by dose to operators in affected unit**



## 6.4 Habitability Systems (cont'd)

- ❑ **All postulated releases of toxic chemicals resulted in concentrations below IDLH**
  - **No procedure required for MCR operators to take protective action in response to chemical releases**
  - **Instrumentation not required to detect and automatically isolate CRE from chemical releases**
  - **MCR can be isolated manually**



## **6.6 Inservice Inspection of Class 2 and 3 Components**

- PSI Program and ISI Program will be implemented prior to fuel load**
  
- Augmented ISI Program to protect against postulated piping failures will also be implemented prior to fuel load**



## Acronyms

- ❑ **ASLB**      **Atomic Safety and Licensing Board**
- ❑ **COL**      **Combined License**
- ❑ **CRE**      **Control room envelope**
- ❑ **DCD**      **Design Control Document**
- ❑ **FSAR**      **Final Safety Analysis Report**
- ❑ **HVAC**      **Heating, ventilation, and air conditioning**
- ❑ **IBR**      **Incorporated by reference**
- ❑ **IDLH**      **Immediately dangerous to life and health**
- ❑ **ILRT**      **Integrated leak rate test**
- ❑ **ISI**      **Inservice inspection**
- ❑ **MCR**      **Main control room**
- ❑ **NEI**      **Nuclear Energy Institute**
- ❑ **PSI**      **Pre-service inspection**
- ❑ **RMI**      **Reflective Metal Insulation**
- ❑ **SER**      **Safety Evaluation Report**
- ❑ **US-APWR**      **United States Advanced Pressurized Water Reactor**



# **Presentation to the ACRS Subcommittee**

**Comanche Peak Nuclear Power Plant, Units 3 and 4  
COL Application Review**

**Safety Evaluation Report**

**CHAPTER 6: Engineered Safety Features**

September 17-18, 2013

# Staff's Presentation Order

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- **Ruth Reyes**- Project Manager

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- ♦ **David Nold** – Containment and Ventilation Branch
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- ♦ **Gregory Makar** - Component Integrity Branch
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- ♦ **Jeffrey Schmidt** – Reactor Systems Nuclear Performance and Code Review Branch