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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

MEETING OF THE US-APWR SUBCOMMITTEE

+ + + + +

THURSDAY

FEBRUARY 21, 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, Subcommittee Chairman

J. SAM ARMIJO, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

JOY REMPE, Member

STEPHEN P. SCHULTZ, Member

WILLIAM J. SHACK, Member

NRC STAFF PRESENT:

GIRIJA SHUKLA, Designated Federal Official

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P R O C E E D I N G S

8:31 a.m.

CHAIRMAN STETKAR: The meeting will come to order.

This is a meeting of the United States Advanced Pressurized Water Reactor Subcommittee. I am John Stetkar, Chairman of the Subcommittee.

Members in attendance are Steve Schultz, Dennis Bley, Sam Armijo, Bill Shack, Charlie Brown, and Joy Rempe.

Mr. Girija Shukla of the ACRS staff is the Designated Federal Official.

The Subcommittee will discuss the US-APWR Design Certification Document and the Comanche Peak Combined License Application, Chapter 17, "Quality Assurance and Reliability Assurance," and Chapter 19, "Probabilistic Risk Assessment and Severe Accident Evaluation". The Subcommittee will also discuss Combined License Application Chapter 16, "Technical Specifications" and the loss of large areas of the plant due to explosions or fires related to the Comanche Peak Combined License Application.

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

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1 We have received no written comments or
2 requests for time to make oral statements from the public
3 regarding today's meeting.

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

8 The rules of participation in today's
9 meeting have been announced as part of this notice of
10 this meeting previously published in The Federal
11 Register.

12 Parts of this meeting may need to be closed
13 to the public to protect information proprietary to MHI
14 or other parties. I am asking the NRC staff and the
15 applicant to identify the need to close the meeting
16 before we enter into such discussions and to verify that
17 only people with a required clearance and need to know
18 are present. So, please, especially MHI, be aware of
19 that.

20 A transcript of the meeting is being kept
21 and will be made available as stated in The Federal
22 Register notice. Therefore, we request that
23 participants in this meeting use the microphones located
24 throughout the meeting room when addressing the
25 Subcommittee. The participants should first identify

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1 themselves and speak with sufficient clarity and volume,
2 so that they may be readily heard.

3 A telephone bridge line has also been
4 established for this meeting. To preclude interruption
5 of the meeting, the phone will be placed in a listen-in
6 mode during the presentations and Committee discussion.

7 And I will ask you all please to silence
8 your cell phones during the meeting.

9 We will now proceed, Hossein or Jeff or
10 someone.

11 MR. MONARQUE: Hi. My Name is Stephen
12 Monarque.

13 CHAIRMAN STETKAR: Oh, Steve?

14 MR. MONARQUE: I am substituting for Jeff
15 for the next two days.

16 CHAIRMAN STETKAR: You know the right ones
17 to come to, don't you?

18 (Laughter.)

19 MR. MONARQUE: So, anyway, I wanted to
20 thank the Committee members.

21 My name is Stephen Monarque with the Office
22 of New Reactors.

23 I wanted to thank the Committee members for
24 giving us the opportunity to present three-four chapters
25 over the next two days. I realize it will be a busy

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1 two days for us. I want to point out we have made
2 substantial progress in our ACRS reviews for both
3 applications, and we certainly look forward to our
4 future meetings with you.

5 With that, thank you. I will go ahead and
6 turn it over to MHI.

7 CHAIRMAN STETKAR: Thanks, Stephen.

8 Yes, let's turn it over to MHI.

9 Ryan?

10 MR. SPRENGEL: Good morning again.

11 This is Ryan Sprengel, MNES.

12 It is nice to see everyone again.

13 CHAIRMAN STETKAR: Oh, sure.

14 (Laughter.)

15 MR. SPRENGEL: Everyone is wide awake this
16 morning, which is nice.

17 We will follow similar protocols as
18 previous. Any follow ups, we will either get back to
19 you in the meeting or following the meeting. So,
20 nothing new or different there.

21 And with that brief introduction, I will
22 go ahead and turn it over to Kevin.

23 CHAIRMAN STETKAR: I know one of our
24 members, Sam Armijo, is going to have to leave this
25 morning.

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1 So, Sam, I hate to put you on the spot, but
2 if you have anything specific that you wanted to
3 mention --

4 MEMBER ARMIJO: No, no.

5 CHAIRMAN STETKAR: Okay. I just wanted to
6 make sure in case you did have something, if we passed
7 your departure time.

8 MEMBER ARMIJO: No, no.

9 CHAIRMAN STETKAR: Okay. Thank you.

10 And with that, we will let MHI start.

11 MR. LYNN: Okay. Good morning.

12 My name is Kevin Lynn, and we are here today
13 representing Mitsubishi Heavy Industries. Today we
14 will be discussing Chapter 17 of the US-APWR DCD, which
15 is "Quality Assurance and Reliability Assurance".

16 So, seated along with me, we have several
17 MHI technical experts today: Osami Watanabe, Takashi
18 Kurisaki, Dr. Futoshi Tanaka, and, also, Takayuki
19 Nirasawa. We also have several members of MAS here to
20 support us, as necessary.

21 This slide is just a list of acronyms that
22 may be helpful for you today during our presentation.

23 So, this shows the table of contents for
24 DCD Chapter 17. Chapter 17 includes the quality
25 assurance, or QA, during the design phase; QA during

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1 the construction and operation phase; QA Program;
2 Reliability Assurance Program; QA Program description,
3 and the description of the applicant's program for
4 implementation of 10 CFR 50.65, the Maintenance Rule.

5 Next, this slide shows the relationship
6 between DCD Chapter 17 and any reference, Topical or
7 Technical Reports. The only Topical Report reference
8 in Chapter 17 is the quality assurance program
9 description for the design certification of the US-APWR.

10 And that is referenced from several of the QA sections
11 of Chapter 17.

12 And then, the only Technical Report
13 reference in Chapter 17 is the US-APWR Probabilistic
14 Risk Assessment Technical Report, which is referenced
15 from Section 17.4 for the Reliability Assurance
16 Program.

17 Okay. We will start with Section 17.1, the
18 quality assurance during the design phase. The QA for
19 the design phase certification for the standard plant
20 design, we are going to defer all of that discussion
21 into 17.5, which we will cover in a minute.

22 But for the site-specific portion of the
23 design activities, the responsibility for QA during that
24 portion is the responsibility of the COL applicants.

25 Next is quality assurance during

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1 construction/operation phases. During those phases,
2 the responsibility for QA is to the COL applicants and
3 it is not covered in the DCD.

4 Next, the Quality Assurance Program, again,
5 as I said, we are going to discuss all of those aspects
6 in 17.5, which will be covered in a few minutes, for
7 the design certification. Just to reiterate, the
8 Quality Assurance Program for the site-specific design
9 or the construction operation is deferred to the COL
10 applicants.

11 So, now we will move into the Reliability
12 Assurance Program discussion. The purpose of the
13 Reliability Assurance Program, or RAP, activities is
14 to provide reasonable assurance, first, that the US-APWR
15 is designed, constructed, and operated in a manner that
16 is consistent with the assumptions that we have made
17 for the risk insights, for the risk-significant SSCs.

18 Second, that the risk-significant SSCs do not degrade
19 unacceptably during plant operation. Third, that the
20 frequency of transients that challenge these
21 risk-significant SSCs is minimized. And fourth, that
22 the risk-significant SSCs function reliably when they
23 are challenged.

24 So, all of the Design Reliability Assurance
25 Program, or D-RAP, activities for the US-APWR are

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1 implemented in accordance with Section 17.4 of the
2 Standard Review Plan, the SRP, and, also, the Interim
3 Staff Guidance that has been provided on the reliability
4 assurance.

5 And we divide the D-RAP activities into
6 three phases. The first phase being the design
7 certification phase, which is obviously the focus of
8 the DCD and will be the focus of our presentation. The
9 next two phases, the site-specific phase and the
10 procurement fabrication, construction, and
11 pre-operational testing phase, will come later.

12 Next, we will talk about how the D-RAP is
13 implemented. So, we have a process for identifying the
14 SSCs that fall under the scope of the RAP. That process
15 uses a combination of several sources to identify those
16 SSCs. So, we use the Probabilistic Risk Assessment,
17 the PRA; the Severe Accident Evaluation; industry
18 operating experience, and use of an expert panel, all
19 of which will be addressed in the following slide.

20 So, we use the PRA, as just mentioned. And
21 this slide shows the scope of the PRA that is used for
22 identifying the risk-significant SSCs. So, first, the
23 Level 1 and Level 2 interval events at power. Then,
24 the Level 1 and Level 2 external events at power, which
25 includes internal fires and internal flooding. Third,

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1 the low-power shutdown operations. And finally, the
2 seismic, which is the PRA-based seismic margin analysis.

3 This slides shows how the PRA is used to
4 identify the risk-significant SSCs. So, we have the
5 components that are modeled in the US-APWR, and then
6 we judge them against certain importance criteria which
7 are the Risk Achievement Worth and the Fussell-Vesely
8 importance criteria.

9 So, those two criteria are used with certain
10 values that are used to separate these components into
11 a list of risk-significant SSCs based on the PRA, and,
12 then, also a list of SSCs that are not risk-significant.

13 So, we have those two lists.

14 Next, then, the PRA-based seismic margin
15 analysis is used to identify additional SSCs that are
16 risk-significant.

17 And, then, finally, key insights from the
18 PRA and insights from the severe accident evaluation
19 are used to identify additional risk-significant SSCs.

20 Next, we move on to the role of the Expert
21 Panel in this process. So, the previous slide
22 demonstrated how we got a list of risk-significant and,
23 then, not-risk-significant SSCs. Then, the Expert
24 Panel will use those results, including the PRA results,
25 to review and then finalize the list of SSCs.

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1 And it is important to point out that the
2 Expert Panel doesn't just look at the ones that are
3 deemed to be risk-significant, but also looks at the
4 SSCs that are deemed to be not-risk-significant when
5 they review and finalize the list. And, of course, the
6 Expert Panel also considers operating experience from
7 the nuclear industry when they make the finalization
8 of the list.

9 MEMBER BLEY: Can the Expert Panel remove
10 items that scored high on the risk indicators from the
11 list?

12 MR. LYNN: Can they remove items?

13 MR. WATANABE: Yes, they can, but,
14 actually, they didn't do that.

15 MEMBER BLEY: I would expect they would
16 need a pretty good justification and, essentially, need
17 to say the PRA is wrong in some sense.

18 (Laughter.)

19 CHAIRMAN STETKAR: That would be bigger
20 problems.

21 MEMBER ARMIJO: What about the other way;
22 the Expert Panel sees things that didn't come close in
23 the selection? Is it difficult for them to put
24 something and redefine it as risk-significant, even
25 though the PRA work showed it wasn't?

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1 DR. TANAKA: No.

2 MEMBER ARMIJO: Just purely on judgment?

3 DR. TANAKA: No, the Expert Panel can add
4 SSCs to the list, even if it has not been determined
5 risk-significant based on the PRA.

6 MEMBER ARMIJO: But, typically, would that
7 be sort a consensus opinion of the panel or --

8 DR. TANAKA: Yes.

9 MEMBER SCHULTZ: Does that lead to any
10 discussion or is it the opinion of the Expert Panel is
11 taken as additional input as it is? And if the Expert
12 Panel makes the decision that something needs to be added
13 or removed from the list, then it is done? Or is
14 discussion/elaboration associated with the decision of
15 the panel? What type of interaction is held with the
16 panel?

17 DR. TANAKA: Okay. What kind of
18 discussion is held with the panel? Yes, first, they
19 check the equipment, of course, that has been identified
20 not to be risk-significant based on PRA. They also have
21 a equipment list that has not been captured to be
22 risk-significant. They go through the list. If they
23 identify any equipment that potentially could be
24 risk-significant, based on their expert opinion, they
25 will have a discussion, and if they agree, they will

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1 put that item in the D-RAP list.

2 MEMBER SCHULTZ: And the rank ordering, it
3 is associated with the different types of risk that is
4 associated with the risk of the facility; in other words,
5 early release frequency, large early release frequency,
6 the core melt frequency? What elements are identified
7 as consisting of the risk?

8 DR. TANAKA: Okay. Yes.

9 MEMBER SCHULTZ: Or is it looked at from
10 different directions and associated with the risk
11 evaluation?

12 DR. TANAKA: Yes. Also, consideration is
13 taken from the viewpoint of core damage risk, large
14 release, and plant trip. These are considered during
15 the Expert Panel, and if any SSCs add impact to that
16 and increase the risk, they are candidates to be included
17 in the list, yes.

18 MEMBER SCHULTZ: So, there has been
19 experience. The panel has not taken anything from the
20 list of significant items. What has been added by the
21 Expert Panel? What types of things have been added?

22 MR. WATANABE: The penetration vent of the
23 main control room is the one SSC that the Expert Panel
24 added to the risk-significant incidences.

25 MEMBER SCHULTZ: Okay. That is a good

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1 example. Thank you.

2 MEMBER BLEY: Is there anything in the
3 process that, should the Expert Panel identify
4 something, like the example you cited, that reflects
5 that back to the PRA to see if something was missing
6 in the PRA model?

7 DR. TANAKA: Sir, can you --

8 MEMBER BLEY: Yes. The Expert Panel
9 decides to add some aspect, ventilation perhaps. Is
10 there anything in the process that, then, refers that
11 information back to the PRA to look and see if the PRA
12 modeled that system at all or they modeled it properly?

13 If there is some reason we suspect the risk is
14 significant enough to add, maybe there is something
15 missing in the PRA. Is there a process to track that?

16 DR. TANAKA: Yes. The Expert Panel looks
17 at the list, and in that way, maybe they can find an
18 SSC that has been identified risk-significant. They
19 will question to the PRA experts why is it
20 risk-significant. It could be opposite: why is this
21 not risk-significant? And we have communication with
22 the PRA expert.

23 MEMBER BLEY: Okay. I didn't see anything
24 in the process that indicated that step was really there,
25 but I hope it is.

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1 DR. TANAKA: Part of the discussion, yes.

2 MEMBER BLEY: Okay.

3 CHAIRMAN STETKAR: Let me follow up on that
4 particular example that you mentioned. The main
5 control room ventilation system is not modeled in the
6 PRA, period. It is not modeled in the PRA. The Expert
7 Panel identified it as something that was worthy of
8 adding to the D-RAP list. Why is the main control room
9 ventilation system not modeled in the PRA?

10 That is Dennis' question, a specific
11 example, a very specific example.

12 MEMBER BLEY: Right. Or did it work and
13 not get there?

14 CHAIRMAN STETKAR: Why was it not modeled
15 in the PRA?

16 DR. TANAKA: The PRA considered the control
17 ventilation system as a function to remove heat,
18 including the control room. The PRA did analysis in
19 control room heat up. Also, they have identified that
20 they can also remove to the no-shutdown panel.

21 CHAIRMAN STETKAR: Okay. Let me stop you
22 there. Where is that analysis documented? You
23 mentioned the PRA did an analysis. I couldn't find that
24 analysis documented anywhere. Where is that analysis,
25 the room heat up analysis, for the main control room?

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1 DR. TANAKA: That should be in the PRA
2 Technical Report or --

3 CHAIRMAN STETKAR: Fifteen -- I will look
4 it up later.

5 DR. TANAKA: Yes.

6 CHAIRMAN STETKAR: I couldn't find it.

7 You also mentioned that the operators -- and
8 I read this -- that the operators, if it got too hot
9 in the main control room, could leave and go to the remote
10 shutdown center that is cooled by what you classify as
11 a diverse HVAC system and, indeed, it is cooled by the
12 same chilled water system as the main control room.

13 That abandonment of the main control room,
14 if it gets too hot, is not modeled in the PRA. So, if
15 you are taking credit in these words that you tell us
16 for things that the operators will need to do, why aren't
17 they modeled in the PRA? They are not modeled in the
18 PRA, you know; trust me. I looked.

19 (Laughter.)

20 DR. TANAKA: When you say "modeled," it is
21 a specific value is not --

22 CHAIRMAN STETKAR: They are not modeled at
23 all. The likelihood that ventilation fails, the
24 likelihood that the operators may need to leave the
25 control room at a certain time, the likelihood that they

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1 successfully leave, the likelihood that they control
2 from the remote shutdown center, the likelihood that
3 the remote shutdown center has cooling, the likelihood
4 that the equipment may fail because it overheats, none
5 of that is included in the PRA.

6 MEMBER BLEY: Nor the effect on the
7 operators.

8 CHAIRMAN STETKAR: Nor the effect on the
9 operators. None of it is modeled in the PRA. And yet,
10 the Expert Panel said, "Well, we think the main control
11 room ventilation system is pretty important. So, we
12 want it to be reliable."

13 There are many, many, many examples like
14 this of things that are not at all modeled in the PRA,
15 many examples of things that are not modeled in the PRA
16 that it is not clear the Expert Panel even thought about,
17 because they are not at all modeled in the PRA.
18 Non-safety-related systems are not modeled in the PRA,
19 by and large. I see things for essential chilled water
20 that the Expert Panel agreed specific valves because
21 they are modeled in the PRA should be included. I don't
22 see anything about the chillers or, for example, the
23 train. I think it is a decondenser water pump that
24 actually provides the water. It is not listed on this
25 list.

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1 So, I am really curious about how the Expert
2 Panel used the information to populate this list. I
3 see things on here that were not modeled in the PRA.

4 But I don't know how they addressed things
5 that weren't modeled at all in the PRA that might be
6 important. Now I am sure they did, and I am sure that
7 process must be documented somewhere. So, I am curious
8 to see where the documentation is of their discussion
9 about disposition of specific systems that are not
10 modeled in the PRA that they said, "Well, let's think
11 about." They thought, obviously, about the main
12 control room ventilation and added it. They must have
13 thought about other things and decided not to add them,
14 for some reason.

15 Is there a report from the Expert Panel that
16 documents their deliberations that we could see, so that
17 we understand better why they decided that things that
18 are not modeled in the PRA are not important?

19 DR. TANAKA: There is an internal report,
20 only for MHI. There is no report that has been
21 submitted.

22 CHAIRMAN STETKAR: We will ask the staff
23 if they looked at any of that backup documentation when
24 they come up.

25 Thank you.

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1 MR. LYNN: Okay. We will continue. We
2 were discussing the Expert Panels. The members who make
3 up the Expert Panel have to meet certain qualification
4 standards, including level of education and experience.

5 And the Expert Panel is also made up of members who
6 have sufficient knowledge of PRA, plant operations,
7 plant maintenance, design engineering, and QA, in order
8 to represent multiple areas of expertise.

9 MEMBER REMPE: So, did the NRC review who
10 was selected and their qualifications as part of this
11 process, too?

12 MR. WATANABE: Does the NRC check the
13 qualifications of all Expert Panel members?

14 MEMBER REMPE: They did?

15 MR. WATANABE: I don't think so.

16 MEMBER ARMIJO: I guess my question was
17 really getting to the point, is the Expert Panel a
18 decisionmaking body or is it simply an advisory body
19 to some design manager, let's say?

20 MR. WATANABE: Excuse me. Can you explain
21 again?

22 MEMBER ARMIJO: Yes. Is the Expert Panel,
23 when they do their review --

24 MR. WATANABE: Yes.

25 MEMBER ARMIJO: -- do they have the

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1 authority to make a decision to add something and make
2 it risk-significant on their own or are they advising
3 someone else that it should be done, and that other
4 person can either accept the recommendation or reject
5 it? Are they advisors or are they decisionmakers?

6 MR. WATANABE: How --

7 DR. TANAKA: Yes, they can make a decision.

8 MEMBER ARMIJO: They can?

9 DR. TANAKA: Yes.

10 MEMBER ARMIJO: Okay.

11 MEMBER SCHULTZ: Does the Expert Panel's
12 responsibility go beyond identification of the SSCs that
13 are important to safety? In other words, with regard
14 to the Reliability Assurance Program, do they also
15 weigh-in on elements of the Reliability Assurance
16 Program, looking at degradation of SSCs, how the
17 degradation of the SSCs is monitored, and the goal of
18 the Reliability Assurance Program of assuring that the
19 SSCs do not degrade within the operation or lifetime
20 of the facility? I mean, do they go into the Reliability
21 Assurance Program to a greater depth than just the
22 identification of importance?

23 MR. WATANABE: So far, they just apply
24 certain issues. They do not discuss so deeply into the
25 operation phase of things.

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1 MEMBER SCHULTZ: Okay.

2 MR. LYNN: I think, as we discussed
3 earlier, there are several phases, on this slide, there
4 are several phases of the D-RAP activities.

5 MEMBER SCHULTZ: Right.

6 MR. LYNN: And this phase is the design
7 certification. So, it is selecting the list. But I
8 think what you are asking about, the following of these
9 would fall under the other phases here, the construction
10 and pre-operational testing. Maybe those I think is
11 what you are asking about.

12 MEMBER SCHULTZ: Well, that is part of it.
13 That is part of it, but the Reliability Assurance
14 Program itself, there is a requirement and a need to
15 identify what is suitable, what is a suitable measure
16 of degradation for these important components.

17 MEMBER SHACK: Or in the design phase, what
18 are the design requirements --

19 MEMBER SCHULTZ: Right.

20 MEMBER SHACK: -- and the appropriate
21 quality controls to put on especially those non-safety
22 systems that get somehow included in the D-RAP list?
23 Does the panel identify those? Or that is sent back,
24 again, to the design engineering group?

25 MEMBER SCHULTZ: Why I am asking the

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1 question is that you indicated that the Expert Panel
2 is very familiar with operational experience. And I
3 was thinking that this was what they would bring to the
4 table, not only identifying what components are
5 important, but what operational experience has
6 demonstrated equipment degradation, other features that
7 are related to the assurance of important to safety in
8 the Reliability Assurance Program. In other words, not
9 only this needs to be on the list, but here are some
10 things to watch out for with regard to this particular
11 component, safety. This is the operational experience
12 that is important for reliability assurance, just
13 another level of details or depth associated with
14 assuring the performance of a component by pointing out
15 the operational experience that has likely affected the
16 PRA results.

17 CHAIRMAN STETKAR: We have seen things from
18 other designs, and the capacity designs generate a -- my
19 mind is slipping --

20 MEMBER SHACK: RTNSS.

21 CHAIRMAN STETKAR: -- RTNSS -- thank you,
22 Dr. Shack -- a Regulatory Treatment of Non-Safety
23 Systems list, and that is an acronym that is used
24 specifically for the passive designs. The so-called
25 active designs, like the US-APWR, are developed with

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1 the so-called Design Reliability Assurance Program
2 list. I kind of think of those in parallel.

3 We have seen applicants come in with
4 separate reliability control documents, if you will,
5 for RTNSS systems, that look a lot like a technical
6 specifications, but are administered and managed
7 separately from technical specifications. We have been
8 told that they control at a high level the availability
9 of those additional systems that are outside the tech
10 specs, and that, on a more detailed level, that equipment
11 is also folded into the Maintenance Rule Program from
12 a normal operational maintenance perspective.

13 I haven't seen any of those types of
14 controls documented for your D-RAP equipment that is
15 not safety-related equipment, that it is not in the
16 technical specifications. And there are some items on
17 your list that are like that, I think. I am not sure.

18 It is a long list, and I didn't go through every item
19 and think about it.

20 Are you developing that type of, let's call
21 it, a parallel set of reliability control guidelines?

22 I want to try to avoid the use of technical
23 specifications because they are different than the
24 technical specifications. They feel a lot like them,
25 but they are different.

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1 I didn't see any of that proposed. Is
2 there? Are you planning to do that? In particular,
3 for anything on the D-RAP list that is not already
4 covered by the technical specifications?

5 MEMBER SCHULTZ: That is what I was looking
6 for.

7 CHAIRMAN STETKAR: Yes.

8 MEMBER SCHULTZ: And also, did the Expert
9 Panel advise on how that --

10 CHAIRMAN STETKAR: Well, they can put
11 things on the D-RAP.

12 MEMBER SCHULTZ: Right.

13 CHAIRMAN STETKAR: Once it is on there, how
14 it is treated, that is, I think, what we are trying to
15 understand. Once it is on the D-RAP list, and it is
16 not in the technical specifications, a lot of the
17 equipment that is in this big, long list are already
18 covered by the tech specs --

19 MEMBER SCHULTZ: Would be covered, right.

20 CHAIRMAN STETKAR: -- and, by
21 implications, would be covered under the Maintenance
22 Rule, and so forth.

23 What I am curious about is anything that
24 is on that list that is not already covered by the
25 technical specifications, if there is anything like

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1 that. And I think there may be. How will the
2 reliability of that equipment, those SSCs, be controlled
3 going forward? Because I don't see any commitments to
4 programs to do that. Maybe I missed something, but
5 since Steve raised it, I think we are both asking about
6 the same thing.

7 DR. TANAKA: Yes, we do not intend to add
8 any requirements to the tech spec based on the D-RAP.

9 CHAIRMAN STETKAR: And I understand that.
10 I think in consistency with all of the other design
11 centers, that is perfectly consistent. I am careful
12 what words I use.

13 What I am asking about is that in many of
14 the design centers we have the technical specifications
15 on the one hand that cover all of the safety-related
16 equipment, and we have another set of parallel, let's
17 call them reliability assurance control documents that
18 govern the reliability, again, at a high level of
19 equipment that is on the D-RAP list, but not included
20 in the technical specifications.

21 An example would be -- and it is not on the
22 list -- an example would be a main feedwater pump.
23 Suppose, for example, the Expert Panel decided that the
24 main feedwater pump should be included on the D-RAP list.

25 They are obviously not part of the technical

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1 specifications. They are non-safety-related
2 equipment. But, for some reason, they are on the D-RAP
3 list. How will the reliability of that type of
4 component be assured going forward, at two levels? One
5 in terms of something that looks like the technical
6 specifications but is different, that says if you have
7 a main feedwater pump out of service, you should do
8 something. And at another level, a more detailed level,
9 that controls what I call the fine structure
10 reliability, maintenance of that equipment, the testing
11 of that equipment to assure its reliability, which would
12 be equivalent to the Maintenance-Rule-type applications
13 for safety-related equipment that is included in the
14 tech specs. That is, in principle, what we are asking
15 about.

16 So, if you use this sort of thought
17 experiment about a main feedwater pump, if that type
18 of a component were included in the D-RAP list, how would
19 its reliability be controlled moving forward? And I
20 don't see that type of program in here.

21 MR. WATANABE: We only have the
22 risk-significant SSC list as provided in the DCD.

23 CHAIRMAN STETKAR: Okay.

24 MR. WATANABE: But we know that we to break
25 down or categorize the more detailed component list and

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1 designate which kind of a component is classified as
2 the risk-significant. But those kinds of procedures
3 or documents are under development.

4 CHAIRMAN STETKAR: It is still under
5 development?

6 MR. WATANABE: Yes.

7 CHAIRMAN STETKAR: Okay.

8 MR. HAMZEHEE: John?

9 CHAIRMAN STETKAR: Let me follow up for a
10 second.

11 Does that mean -- and I am looking at a line
12 item right now that just says "main feedwater system,"
13 okay? And what I am hearing from you is that you still
14 need to do some work to subdivide at least that into
15 individual components, and so forth.

16 However, I am still left with in the DCD
17 there is a line item that says the main feedwater system,
18 whatever that means, is on the D-RAP list. And I don't
19 see the programs that will control the reliability of
20 that system, or parts of that system, after you finally
21 finish the analysis. I don't see commitments to those
22 types of programs here in Chapter 17.

23 And I was curious; I think that is what we
24 are asking about, not necessarily the fine detail of
25 exactly which component may or may not be on the list

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1 today. But I am assuming because the main feedwater
2 system is on there, there will be at least one main
3 feedwater pump on it that survives.

4 MEMBER BLEY: Given it is on the list, what
5 kind of special treatment, special following is
6 required? That is what he is asking.

7 CHAIRMAN STETKAR: And, Hossein, now you
8 can --

9 MR. HAMZEHEE: It has been a while since
10 I wrote on this. So, just in concept, as you know, I
11 think he mentioned that, when the staff developed the
12 RAP program, we put them into three phases. We said
13 design phase, construction phase, and operational
14 phase.

15 CHAIRMAN STETKAR: Right.

16 MR. HAMZEHEE: You now somehow jump into
17 the operation phase. What they are supposed to do under
18 design is to appropriately define what they believe,
19 based on risk and operating experience,
20 risk-significant SSCs are, and try to set some
21 reliability goals and targets for these.

22 When we get to the construction phase, then
23 we have to ensure that, when we do the fabrication,
24 installation, and construction, they pay attention to
25 what kind of reliability or equipment they should use.

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1 And when it gets to the operational phase, then the
2 COL applicant has the responsibility to make sure that
3 they maintain the reliability of these SSCs either
4 consistent with the PRA assumptions or assign and come
5 up with their own assumptions.

6 So, hopefully, once you follow those three
7 phases, you should cover all these things that you are
8 bringing up right now.

9 MEMBER BLEY: Yes, but, okay, this phase
10 has those reliability targets you spoke of.

11 MR. HAMZEHEE: Correct.

12 MEMBER BLEY: And I think that is part of
13 what --

14 MR. HAMZEHEE: They should identify the
15 SSCs and some target reliabilities for the COL
16 applicant.

17 CHAIRMAN STETKAR: Yes. And the way that
18 has been done -- again, each design center can be
19 somewhat different -- the way that that has been done
20 in some of the other design centers is to specify this
21 kind of special treatment. I like that term better than
22 my alternate reliability control programs.

23 MR. HAMZEHEE: Yes. Now you may also be
24 remembering something from RTNSS which is very close
25 but a little different.

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1 CHAIRMAN STETKAR: Well, I am, in
2 particular. And as I said in my introduction,
3 conceptually, I don't think of those two things
4 differently. I am not an attorney. So, I just think
5 of these things as --

6 MR. HAMZEHEE: All together.

7 CHAIRMAN STETKAR: -- non-safety-related
8 things that are not in the technical specifications that
9 ought to be reliable because somebody thinks they are
10 important.

11 MR. HAMZEHEE: Yes.

12 MEMBER SHACK: See, I think of it in terms
13 of 50.69 where I am looking in the design phase for
14 special fabrication and requirements --

15 MR. HAMZEHEE: Correct.

16 MEMBER SHACK: -- that belong here even
17 though they are not necessarily safety-significant
18 components that suddenly fall under all the Appendix
19 B stuff.

20 MR. HAMZEHEE: Right. Yes. That's
21 right. Now the challenge here, again, the staff has
22 talked about this, and the SRP is in place, and the
23 Guidance Document is in place. But the concern was,
24 as I think John articulated very well, that the SSCs
25 that are identified risk-significant, a number of them

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1 are safety-related. Those are covered under the
2 Appendix B requirements. So, you don't worry.

3 MEMBER SHACK: Right.

4 MR. HAMZEHEE: A number of them that are
5 non-safety-related, they are covered under the
6 Maintenance Rule. So, we have programs in place that
7 would handle those.

8 MEMBER SHACK: Well, Maintenance Rule is
9 fine for operational.

10 CHAIRMAN STETKAR: Right.

11 MEMBER SHACK: You know, we are back here
12 in design-land where they are supposed to have ITAAC,
13 I think.

14 MR. HAMZEHEE: We do have ITAAC for RAP.

15 MEMBER SHACK: For the D-RAP. And that was
16 what I was sort of missing here, was a detailed
17 description of where those ITAAC were for these
18 components. You know, there is a statement that I need
19 ITAAC, but I wasn't sure what the ITAAC looked like or
20 where they would be documented.

21 MR. HAMZEHEE: Yes, and they will talk
22 about it. When the staff gets here, I think they can
23 explain the process that they follow to review and ensure
24 that these are all reviewed and the proper ITAAC is
25 identified for us.

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1 But I just wanted to mention that the three
2 phases will, hopefully, if done correctly, cover all
3 these concerns.

4 MEMBER SHACK: Well, there is this notion
5 that everything on the D-RAP list becomes a high
6 safety-significant component in the Maintenance Rule,
7 which sort of tells you how it gets carried over to the
8 Maintenance Rule and the O-RAP program.

9 MR. HAMZEHEE: But there is a small
10 population that may not be under the Maintenance Rule.

11 Then, you need to make sure that these are also --

12 MEMBER SHACK: Well, as I understand it,
13 everything on the D-RAP is going to become a high
14 safety-significant component in the Maintenance Rule.

15 CHAIRMAN STETKAR: In principle, that is
16 the way I read that it is supposed to work. But that
17 still doesn't necessarily solve your question about --

18 MEMBER SHACK: What do you do in the design
19 phase, right.

20 CHAIRMAN STETKAR: -- design and
21 procurement.

22 MEMBER BLEY: I have a point of
23 clarification for me. I can guess, but I would rather
24 have you tell me.

25 In the text and in the table, you speak of

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1 things identified by Engineering Judge. Can you tell
2 me what that is? That is clearly delineated separately
3 from the Expert Panel. Who? Who is the Judge? Who
4 gets things on this list? Who is not part of the Expert
5 Panel?

6 DR. TANAKA: Some of the Engineering Judge
7 was done by the PRA team because some components were
8 not modeled, basically, in the PRA, but they knew that
9 the structure or the component should have similar risk
10 importance compared to components that support the
11 function.

12 For instance, the accumulator, this is a
13 structure. The structure didn't have a failure mode
14 in the PRA. It was not modeled as an event. But, of
15 course, the failure of the function was modeled, but
16 I think it, essentially, was not modeled in the PRA as
17 a basic event. It did not have the RAW values or the
18 Fussell-Vesely values which you use as a criteria to
19 pick the --

20 MEMBER BLEY: So, these would be things
21 they included in the model in a functional way without
22 actually trying to deconstruct it into detailed items
23 of failure? Now there are pumps and other things that
24 are here by EJ as well, but those all come from the PRA
25 team and they are things that they didn't model directly,

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1 but they still think are important?

2 DR. TANAKA: I can't say whether it is all,
3 but, yes, some come from the PRA team and some were Judge
4 because it provides a function to -- it is necessary
5 to prevent some specific events. Like hydrogen
6 igniters were put in there because of an engine judgment.

7 The risk significance could have been small, but the
8 team judged that to prevent hydrogen explosion; that
9 is a necessary component and, therefore, it should be
10 covered by the D-RAP. So, those kinds of judgments were
11 done, some by the PRA team, who knew the model and who
12 knew what was not in the model.

13 MEMBER BLEY: Given I didn't know that, I
14 didn't think hard about whether I would think they should
15 be in the PRA model or not, but I will have to go home
16 and think about that.

17 (Laughter.)

18 DR. TANAKA: Igniters are in the PRA model.

19 MEMBER BLEY: I'm sorry?

20 DR. TANAKA: Igniters are in the PRA model.

21 MEMBER BLEY: Okay. So, some of these
22 things are there, but they turned out not to have high
23 RAW or Fussell-Vesely importance?

24 DR. TANAKA: Yes, yes. Of course, when
25 they think about the uncertainties, they thought they

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1 should be in there.

2 MEMBER BLEY: Okay.

3 DR. TANAKA: In this case, this is because
4 of the structure. It is not modeled in the PRA of the
5 structure failure.

6 MEMBER BLEY: I think that is an
7 interesting story. It is too bad it is not in the report,
8 how that happened.

9 Thanks.

10 CHAIRMAN STETKAR: That is what I was
11 asking for. It would be nice to see who sat down with
12 all of these things and systematically went through,
13 in principle, everything in the plant and said, "This
14 is in," for these reasons; "This is out," for these
15 reasons.

16 MEMBER BLEY: In principle, there should
17 be a document that records these judgments --

18 CHAIRMAN STETKAR: Right.

19 MEMBER BLEY: -- and what the bases were
20 for them.

21 CHAIRMAN STETKAR: For posterity or if the
22 PRA changes, as it evolves, for example, some of those
23 judgments might be supported more clearly by numerical
24 results from the PRA, if things are added to the PRA,
25 or some of the judgments might actually change if the

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1 PRA, you know, models the equipment and shows that it
2 is really not as important as some experts perhaps it
3 to be qualitatively.

4 MEMBER SCHULTZ: But again, John, to
5 Dennis' point, if that is documented, then the rationale
6 is there for a PRA team to look at later and say, "Well,
7 I know quantitatively I can demonstrate that it might
8 not be so important," but looking back at the rationale
9 that was done by the design team, they may understand
10 why it is there.

11 CHAIRMAN STETKAR: Not just the PRA team;
12 I mean people who actually have to run the tests and
13 maintain this equipment going forward for 60 years.

14 MEMBER SCHULTZ: Exactly. Exactly. And
15 we have had experiences where decisions were changed
16 because they didn't have the rationale of the original
17 team that made that decision. And another team looks
18 at it and says, "Shouldn't have done that."

19 CHAIRMAN STETKAR: Well, I think what we
20 heard earlier is that they have --

21 MEMBER SCHULTZ: It is important to
22 document it.

23 CHAIRMAN STETKAR: -- an internal report
24 that did that. It is just that it has not been submitted,
25 and at the moment it is not available to us.

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1 MEMBER SCHULTZ: Well, it needs to be
2 available to the construction team and the operation
3 team.

4 MEMBER BLEY: I guess anytime one does an
5 analysis based on expert judgment, expert elicitation,
6 it seems incumbent to document the basis, so that one
7 who is on the staff perhaps, or somebody else, can
8 evaluate the reasonableness of it, and as Steve said,
9 later, even people from the same organization or even
10 the same people can remember just why these things have
11 been judged the way they have been. It seems like that
12 ought to be part of the record somewhere.

13 I'm done.

14 MEMBER BROWN: Can I ask a question now,
15 if you are all done?

16 MEMBER BLEY: I'm not running the show,
17 Charlie.

18 (Laughter.)

19 CHAIRMAN STETKAR: I can't say no, either.
20 So, go on.

21 (Laughter.)

22 MEMBER BROWN: This doesn't sound quite as
23 complicated as your all's questions. Mine is more
24 simpleminded. I was trying to figure out -- to me, I
25 am and I&C guy. So, I looked through the list on Chapter

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1 17 of all the D-RAP or all the -- I guess it is 17, Table
2 17.4-1. And there is a particular component within the
3 I&C systems called the MILTAC platform, which is a very,
4 very critical component in terms of its overall
5 operation.

6 At a fairly high level, it has three
7 fundamental areas. You have got hardware. You have
8 got a basic operating system. And then, you have got
9 application code that gets run to generate all your trips
10 and safeguard functions and monitoring information.

11 I don't see the MILTAC platform listed in
12 there. Now, in the SE that the staff did, they commented
13 that the probability of failure of the CCF, Common Cause
14 Failure mode, I guess is based on -- I don't
15 know -- based on 20 million hours of operation of this
16 platform in Japanese nuclear power plants, which is a
17 nice number to have.

18 And on that, you would come up with a
19 reliability number -- and I might be quoting this wrong;
20 I am not a reliability guy -- of something like 5, either
21 1 or 5 times 10 to the minus 8, but you assumed 1 times
22 10 to the minus 7th in the analysis.

23 How long has the MILTAC platform been in
24 operation? I mean, is this 10 years, 15 years? To take
25 20 million hours, you have got to be in a lot of plants

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1 and be running for --

2 CHAIRMAN STETKAR: It is like 2300 years,
3 if you do the math.

4 MEMBER BROWN: Okay.

5 CHAIRMAN STETKAR: Twenty million hours is
6 like 2300 years.

7 MEMBER BROWN: But that is a lot of hours.

8 CHAIRMAN STETKAR: That means they
9 probably installed one back, you know, in --

10 MEMBER BROWN: 1850.

11 (Laughter.)

12 CHAIRMAN STETKAR: No, that would only be
13 about 1500 years.

14 MEMBER BROWN: Okay. That is what I
15 thought.

16 CHAIRMAN STETKAR: We have got to go back
17 into the 1700's.

18 (Laughter.)

19 MEMBER BROWN: You calibrated it. So, the
20 20 million hours is a lot of hours, and that seems like
21 a big number. There was no discussion of the basis for
22 it, at least in the staff's -- and as I said, the
23 applicant them with that information.

24 And I suspect that, if you look at the
25 initial application of the MILTAC platform, whenever

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1 it was, 10 years ago, it had --

2 CHAIRMAN STETKAR: Oh, no, I am going to
3 stop you. You are on a roll.

4 MEMBER BROWN: I am on a roll. Do you want
5 to stop me?

6 CHAIRMAN STETKAR: Yes.

7 MEMBER BROWN: I'm old.

8 CHAIRMAN STETKAR: Well, I was going to
9 say, write simple notes to yourself. I think this is
10 probably a better discussion when we get into the PRA
11 because the folks upfront here may not necessarily be
12 the right people to ask those questions.

13 MEMBER BROWN: I am going to segue down to
14 why this one.

15 CHAIRMAN STETKAR: Okay.

16 MEMBER BROWN: Okay? I was looking for,
17 when I went through the list, there was stuff like valves
18 and little pumps and all kinds of other doohickuses on
19 the D-RAP list. But, yet, when I looked for I&C, there
20 is virtually not a single component that is considered
21 a fundamental component that needs to be assured that
22 it has the appropriate reliability assigned to it and
23 maintained during its design and its application, and
24 its development for this specific project.

25 I suspect that the basic operating software

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1 is not going to be exactly the same as it was 10 or 15
2 years ago, and that the application code for this is
3 not going to be exactly the same as it was for the
4 previous plants. And yet, I see no indication that it
5 is included in the Reliability Assurance Program at all.

6 So, I brought up the other parts just to
7 emphasize the point of why I thought that looked like
8 it was absent.

9 CHAIRMAN STETKAR: That is fair. And a
10 good example would be a line item that says "diverse
11 actuation system".

12 MEMBER BROWN: No, but that is another
13 subject.

14 CHAIRMAN STETKAR: No, but that is fine.
15 Where Charlie is headed is there is a simple line item
16 that just says "diverse actuation system" that was added
17 based on engineering judgment. It certainly -- I
18 hesitate to use the word "modeled in the PRA". There
19 is a basic event in the PRA for failure of diverse
20 actuation. In fact, in the note here it says that it
21 is assumed to be 1-in-100 demands that would fail.

22 What Charlie is asking about is, for
23 everything else, the doohickuses -- I like to drive our
24 recorder crazy; so I hope he has that, the doohickuses
25 (laughter) --

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1 MEMBER BROWN: That is a Kentucky phrase.

2 CHAIRMAN STETKAR: -- for the doohickuses,
3 individual valves. They are very, very precise; this
4 valve leaks; this valve does not open.

5 For something that is like either the PSMS
6 or the DAS, there is simply a line item that says "diverse
7 actuation system" or, in some cases, not even addressed
8 at all.

9 MEMBER BROWN: Yes. So, anyway, that
10 was --

11 CHAIRMAN STETKAR: And I guess that is part
12 of the question of, do you plan to develop more details
13 regarding the digital I&C, either the hardware or -- I
14 will see if I can stay away from the software for the
15 moment -- at least the hardware in terms of the D-RAP
16 list?

17 MR. WATANABE: In terms of the D-RAP list?

18 CHAIRMAN STETKAR: Right.

19 The PRA actually has fairly-detailed models
20 if you delve down into the PSMS, sensors, and things
21 like that. I didn't look at them in detail, but there
22 is certainly a lot more detail than DAS. But Charlie
23 is right that none of that equipment appears on this
24 current list.

25 MEMBER BROWN: One of my basic concerns is,

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1 how do you set targets for reliability of something that
2 is amorphous like basic operating system software and
3 application software? It is pretty difficult to do
4 that. I tried doing that for 20 years in the Naval
5 Nuclear Program and found that -- I mean, you almost
6 always defaulted to line-by-line examinations of code
7 by multiple teams of people who were independent and
8 in separate laboratories to ensure they didn't allow
9 them to talk to each other, as well as developing
10 engineering systems where you set up the entire I&C
11 system and then challenged it by having simulator-type
12 inputs and ran it through so many combinations of switch
13 inputs, operator actions, and everything else, to see
14 what results you got in terms of the performance, and
15 did it really trip when it was supposed to and all that,
16 which took two and three years in some circumstances.

17 And that was just to get us to say, "Well,
18 yes, for the most part is going to work pretty well."

19 But we never could figure out how to assign a
20 1-times-10-to-the-minus-8 or 10-to-the-minus-7
21 probability.

22 And the other problem is you say, "Well,
23 we have had 20 millions." Forget whether that is too
24 many hours, or whatever, wherever that number comes
25 from. If you had even said 10,000 hours or a million

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1 hours -- let's take a million hours, okay? -- how do
2 you know what has been reported? What is a failure when
3 it comes to a software glitch?

4 CHAIRMAN STETKAR: It is still 100 years.

5 MEMBER BROWN: I mean, is it every
6 time -- and I am being facetious, not facetious really,
7 but, I mean, if you look at a computer operation, every
8 time you move your mouse and the little arrow doesn't
9 move, is that a software error because the interrupt
10 didn't pick it up and allow something to be done? Or
11 is that "I guess, well, I will just wait a second and
12 I can go ahead and do something."? There are tons of
13 little things that go on that are unnoticed and may not
14 be registered as software failures.

15 So, it is just how do you develop targets
16 for that is a question I had. I don't know whether I
17 am offbase on that. I am just trying to figure out a
18 way to get the platform into this basic Reliability
19 Assurance Program somehow.

20 I'm done for this part.

21 CHAIRMAN STETKAR: Thank you.

22 I mean, I think you hear some of our concerns
23 about a lot of this does come back to, I think, some
24 of the things that you are hearing from all of us about
25 the process that was used to populate this list. Why

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1 are certain things on it? Why are certain other things
2 not on it? Why are some things at a very, very, very
3 fine-structure detail while other things are really,
4 really broad or perhaps not even there?

5 So, I think we are interested in learning
6 more about that. I don't know how we do that, but maybe
7 we will ask the staff when they come up to see how deeply
8 they have delved into it, also.

9 In the interest of time, we will see if you
10 can actually get through what you thought was probably
11 going to be easy.

12 (Laughter.)

13 MR. LYNN: Well, now that we have moved on
14 to this slide, we might as well continue here. So, when
15 we get to the end, the last of RAP SSCs are identified
16 in the DCD in Table 17.4-1. And this shows an excerpt
17 of that table, as you are clearly familiar with and have
18 looked at.

19 So, in addition to providing the name of
20 the SSC, it also provides its rationale for inclusion,
21 the risk-significant failure mode, and then, the risk
22 insights and key assumptions.

23 And I think there was some question earlier
24 about, you know, where is some of this stuff captured?

25 And we mentioned some documentation that was not

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1 submitted to the staff. But in this list, as you can
2 see, in the far right column we do provide some
3 description of why it was included. Granted, this is
4 a short summary, but it does provide some -- and this
5 is part of the DCD, and this will obviously be carried
6 forward. So, it does provide, for the future, it does
7 give people a sense of why this thing ended up on there.

8 And also, the rationale provides a list of why it ended
9 up on there.

10 And so, you can see that those items that
11 are, say, engineering judgment here, and then, you can
12 look and see, okay, well, why did someone think this
13 was an important, and it gives you that sense. So, I
14 think it does capture some of those things that you are
15 looking for. Maybe you are interested in more detail,
16 but this is just a summary of that. And there is
17 additional documentation internally.

18 CHAIRMAN STETKAR: This does provide, as
19 you said, some insights about why particular items are
20 included in the list, to some level of detail. Some
21 of us were asking questions about the equivalent
22 rationale for EJ or Expert Panel, why something was not
23 included on the list, which obviously doesn't exist
24 here; it doesn't show here. And it is both sides of
25 that, both sides of the ledger.

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1 MEMBER BLEY: And these notes apply to a
2 whole range of things that were put on the list for
3 different reasons. So, they don't really get into why
4 in a particular case the expert who was judging this,
5 be it the panel or the expert judge, decided to go further
6 than the RAW and the Fussell-Vesely. But you are right,
7 it does give a statement of why it is important.

8 MR. LYNN: Yes.

9 So, now moving on to Section 17.5, which
10 is the QA Program description. And as I discussed
11 earlier, the basis for the Quality Assurance Program
12 description is a Topical Report that has been submitted
13 to the NRC, and it is Document PQD-HD-19005. And the
14 QAPD is based on the requirements of 10 CFR 50, Appendix
15 B; 10 CFR 52, and NQA-1, and MHI developed it using the
16 NEI template.

17 So, the most recent revision of this Topical
18 Report was Revision 4, which was submitted April 2011.

19 That version was reviewed and approved by the NRC on
20 November 9th of 2011. And that is documented in the
21 staff's SE for Chapter 17.

22 Finally, covering the description of the
23 10 CFR 50.65, the Maintenance Rule, that implementation
24 of that program is the responsibility for the COL
25 applicants.

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1 This slide discusses the open items from
2 the staff's Safety Evaluation for Chapter 17. This does
3 list an open item, but, as you read further in the SE,
4 it is clear that that open item has been resolved, so
5 that there are, in fact, no open items in the SE.

6 And there were five confirmatory items in
7 the SE. In each case, it tracks an item where MHI
8 proposed a change to the DCD, and that change has been
9 approved, and we are only just waiting to incorporate
10 in the next revision of the DCD, which will be later
11 this summer. And then, these can be closed.

12 And that concludes our presentation today
13 for Chapter 17. Are there any other questions?

14 CHAIRMAN STETKAR: Any questions from any
15 of the members?

16 (No response.)

17 If not, thank you very much. You weathered
18 the storm quite well.

19 I am going to ask the staff, Brian --

20 MR. SPRENGEL: I think I have a question.

21 CHAIRMAN STETKAR: Oh, okay.

22 MR. SPRENGEL: There was lots of discussion
23 about additional detail and interest in the processes
24 that MHI went through and described in the high-level
25 detail. So, we have provided certain information on

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1 the docket and provided it to the members, but I am not
2 clear if additional detail was needed for the review
3 itself.

4 CHAIRMAN STETKAR: Let's wait and hear from
5 the staff first.

6 MR. SPRENGEL: Okay.

7 CHAIRMAN STETKAR: Okay.

8 MR. SPRENGEL: Thanks.

9 CHAIRMAN STETKAR: We will get back to
10 that.

11 If nothing else for MHI, again, thank you
12 very much.

13 And we will ask the staff to come up on
14 Chapter 17 for the DCD.

15 MR. SHUKLA: Please take your name tags.

16 CHAIRMAN STETKAR: Yes, hold onto your name
17 tags. We are a low-budget operation, becoming
18 lower-budget by the minute, as best I can tell.

19 (Laughter.)

20 MR. ROY: Hello. My name is Tarun Roy.
21 I am an NRO Project Manager responsible for US-APWR
22 Chapter 17, Design Certification Application.

23 I have been at the NRC for the last seven
24 years and worked in different places, as an operation
25 engineer, structural engineer, and project manager.

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1 I have several years of experience in the nuclear
2 industry. I worked in the design, construction,
3 Quality Assurance Program. I worked in the Bechtel
4 Corporation and several utility companies.

5 Presenting this to the ACRS Subcommittee,
6 Chapter 17, we have in this program the Construction
7 Electrical Vendor Branch, Greg Galletti. He is absent
8 today, but Branch Chief Kerri Kavanagh. I will call
9 her if any question comes up. And we have Todd
10 Hilsmeier, PRA and Severe Accident Branch.

11 We have no open items in this associated
12 with Chapter 17, fortunately. That is all I can say.

13 If you have any question, Todd or Kerri will answer
14 that.

15 MEMBER ARMIJO: Well, just listening to the
16 discussion earlier, I am surprised you don't have a lot
17 of open items, based on the questions that Committee
18 members have asked. What am I missing?

19 MR. HILSMEIER: I should say our
20 conclusions are not finalized because they are dependent
21 on a lot of supporting sections, like Chapter 19 and
22 the Seismic Margins Analysis. But as those open items
23 are closed, it may impact the RAP. But, based on DCD
24 as it is now, we have no open items.

25 CHAIRMAN STETKAR: Okay. Todd, let me

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1 follow up, though, because recognize that there may be
2 another iteration, or more perhaps, on the PRA itself,
3 and iterations on the PRA will, obviously, or could,
4 change numerical importance measures for specific
5 items, which could either insert them into the existing
6 RAP list or, in principle, they might be removed.

7 But the Expert Panel assessment is not part
8 of Chapter 19.

9 MR. HILSMEIER: Correct.

10 CHAIRMAN STETKAR: Those judgments are
11 made outside -- they are informed by the PRA to some
12 extent, but they are made outside of the context. So,
13 in my understanding, that Expert Panel assessment
14 belongs to Chapter 17. Is that right?

15 MR. HILSMEIER: Correct.

16 CHAIRMAN STETKAR: Okay. And what I am
17 hearing from you is you are saying, if there were no
18 other changes to the PRA itself, you are satisfied with
19 the results from that Expert Panel assessment because
20 that is documented in Chapter 17, and this slide says
21 you have no open items on Chapter 17.

22 MR. HILSMEIER: Right, but there are open
23 items in Chapter 19. So, in essence, I mean, that can
24 change the PRA. Now if the PRA doesn't change as a result
25 of those open items --

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1 CHAIRMAN STETKAR: That's right. Let's
2 say all of the open items that are in there right now
3 are resolved to the PRA team's satisfaction, that,
4 indeed, what is in there is modeled correctly, the data,
5 the models, et cetera. So, that the PRA does not change.
6 Or, even if the PRA does change, you know, some data
7 value is changed that changing a Risk Achievement Worth
8 from 1,760 and reduces it down to 85 or increases
9 something that is now 6 to 15. That doesn't affect
10 whether or not that particular component will be
11 included in the D-RAP list because it still has a Risk
12 Achievement Worth --

13 MR. HILSMEIERS: Right.

14 CHAIRMAN STETKAR: -- greater than two.

15 MR. HILSMEIERS: Right.

16 CHAIRMAN STETKAR: Given all of that, the
17 Expert Panel still reviewed all of that equipment, all
18 of the Risk Achievement Worth values, all of the
19 Fussell-Vesely importance values, and made decisions
20 to in some cases include additional equipment, and I
21 am assuming in many cases active decisions to exclude
22 equipment from the D-RAP list.

23 And I think what you heard us asking MHI
24 is, what is the rationale that was used for those
25 decisions, either to include something because it is

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1 not modeled in the PRA or its Risk Achievement Worth
2 was somewhat less than 2.0, but the Expert Panel decided
3 it was important enough to add.

4 And on the other side of the ledger, what
5 decisions were made to exclude something because it
6 either wasn't modeled in the PRA or was modeled in the
7 PRA and had a low numerical importance value, and the
8 Expert Panel said, "Yes, we believe it is not important
9 enough to be on the list."?

10 And I think what we are asking now in the
11 context of Chapter 17 is, what level of -- you can't
12 do an audit; I'm sorry, you can't do a review of that
13 decision process because, as we heard, the documentation
14 was not submitted on the docket. So, did you do any
15 audits of the Expert Panel evaluations to assure
16 yourself that, indeed, they are reasonably
17 comprehensive and that the experts applied appropriate
18 judgment, in your opinion, to include or exclude
19 specific SSCs from that list?

20 MR. HILSMEIER: I think about two summers
21 ago -- the timing kind of slips my mind because this
22 has been going on for five years, four or five
23 years -- that we did do a mini-audit in conjunction with
24 a PRA audit. During the audit, the applicant provided
25 a presentation on the changes to the PRA model, which

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1 led into Revision 3, I believe. And they also discussed
2 how it impacted the RAP program.

3 And also, as far as doing the formal,
4 detailed audit, I feel that is done through the review
5 process itself. What I mean by that is the PRA staff
6 in Chapter 19 reviews a PRA and confirms that the PRA
7 is consistent with the design. That essentially
8 addresses what we call central elements in the RAP.
9 Central elements in the RAP ensure that there is a
10 process and controls to ensure that the plant is designed
11 consistent with the PRA. That is pretty much done under
12 Chapter 19.

13 The QA staff performs their audits to ensure
14 that the SSCs are subjected to the appropriate quality
15 controls, and that addresses that part of their RAP.

16 And then, the part that is left over is
17 assuring that the RAP list is complete. I feel that
18 the approach that we used to review the RAP list is
19 sufficient, such that a detailed audit is not necessary.

20 The applicant does provide the details of the PRA, all
21 the rolled-up tables, Fussell-Vesely tables, PRA
22 assumptions.

23 And then, if I may go on, I can describe
24 to you our approach for reviewing the RAP list.

25 CHAIRMAN STETKAR: We have time.

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1 MR. HILSMEIER: Okay. I will do that.

2 CHAIRMAN STETKAR: I am interested, by the
3 way -- everything that you have said so far is focused
4 on what is there in the PRA -- I am interested in what
5 is not in the PRA --

6 MR. HILSMEIER: Right.

7 CHAIRMAN STETKAR: -- and why the expert
8 panel added some additional things. Now let me give
9 you two very specific examples, so that we can keep these
10 in mind.

11 We already noted that the Expert Panel added
12 the main control room ventilation system to the D-RAP
13 list. It is on the list. It is not modeled in the PRA.

14 The Expert Panel did not add the essential
15 chilled-water system chillers or circulating water
16 pumps. I couldn't find them on the D-RAP list, and they
17 are not modeled in the PRA.

18 So, there must have been some active
19 decision made by the Expert Panel -- and they are
20 safety-related equipment -- there must have been some
21 active decision made by the Expert Panel that said, "Ah,
22 yes, the essential chilled-water system, it is
23 safety-related, it cools the main control room, it cools
24 the switchgear rooms, it cools the I&C rooms, it cools
25 a lot of pump rooms out in the plant, but we don't think

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1 it's important."

2 Now it is modeled in the PRA, but only for
3 the motor-driven emergency feedwater pump rooms. It
4 is not in the tech specs.

5 So, what I am looking for and trying to
6 understand is, for those two examples, how did you in
7 your determination say that, "Yes, indeed, we think it
8 is reasonable to include the main control room
9 ventilation system in the D-RAP list, and we think it
10 is reasonable to exclude the essential chilled-water
11 system."? And I am actually more interested in the
12 second part.

13 MR. HILSMEIER: When I was in the audience
14 listening to the questions, you brought up the
15 question -- and I am not sure if I am restating it as
16 you said it -- but, basically, there's a lot of SSCs
17 that are not in the PRA that the Expert Panel should
18 look at.

19 And I could have sworn that that process
20 was in the SER, that the Expert Panel does look at all
21 SSCs to see if they are risk-significant or not. And
22 I was diligently back there looking through the SER.

23 I was looking for that statement, although I couldn't
24 find it; like I think you were looking for it, too.

25 CHAIRMAN STETKAR: I couldn't find it, but,

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1 believe me, I have read a lot of stuff over the last
2 couple of weeks, and I could have missed it.

3 MR. HILSMIEIER: Yes. I know other
4 applicants have included that: the Expert Panel looks
5 at all SSCs that are not in the PRA. Well, basically,
6 there is a quote in the DCD: "The Expert Panel also
7 reviews the categorization of SSCs determined to be not
8 risk-significant." So, I am quantifying the result.

9 When I read that the first time, I
10 interpreted that as being they look at all SSCs outside
11 of PRA. Reading it a second time, it might not be so
12 clear.

13 So, based on your comment and based on
14 rereading this comment, I do plan to write an RAI for
15 them to clarify this statement. So, it is important
16 that the Expert Panel sees all SSCs.

17 CHAIRMAN STETKAR: And when we were
18 questioning MHI, I thought that I heard from them that
19 they had an internal report that, I thought what I heard,
20 actually went through that process, reviewed all SCCs --

21 MR. HILSMIEIER: Right.

22 CHAIRMAN STETKAR: -- and said, "These are
23 on the list for this reason," which appear now in the
24 list with an abbreviated rationale, but at least some
25 rationale of why they are on the list, and by

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1 implication, since they reviewed everything, the list
2 of equipment that is not on the list, and why it is not
3 on the formal D-RAP list.

4 MR. HILSMEIER: That's right.

5 MR. SPRENGEL: I have a clarification.

6 CHAIRMAN STETKAR: Okay.

7 MR. SPRENGEL: The chilled-water system
8 and essential chiller units, essential chilled-water
9 pumps, et cetera, are in the D-RAP list.

10 CHAIRMAN STETKAR: They are? Where?

11 MR. LYNN: Are you looking at DCD Rev. 3?

12 CHAIRMAN STETKAR: I am looking at DCD Rev.
13 3. Point me to the page of Table 17.4-1. It is easier
14 for me to flip to that because --

15 MR. LYNN: Well, start with sheet 45. I
16 am looking at a different version.

17 CHAIRMAN STETKAR: I will get down to sheet
18 45. VSW, essential chilled-water, I see valves. I see
19 cooling-line flow meters.

20 MR. HILSMEIER: The acronym used for
21 chilled-water system is actually VSW, if you are doing
22 an acronym search.

23 CHAIRMAN STETKAR: I didn't do that acronym
24 search. And in the interest of time, why don't we just,
25 rather than both of us looking real-time on the record,

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1 if you can --

2 MR. LYNN: It is on sheet 42.

3 MEMBER SCHULTZ: It is on sheet 48 on the
4 version I am looking --

5 MR. SPRENGEL: I'm sorry. Page 48, but --

6 MEMBER SCHULTZ: Oh, okay, you're right.

7 MR. SPRENGEL: -- it is sheet 42 --

8 MEMBER SCHULTZ: You're right.

9 MR. SPRENGEL: -- for Table 17.4-1.

10 MEMBER SCHULTZ: I just found it.

11 CHAIRMAN STETKAR: Thank you. I stand
12 corrected. The chiller units and the pumps are on
13 there. They are, only two of them, though. Only two
14 of them because those are the only two that were modeled
15 for the two emergency feedwater pump rooms. This
16 specifically calls out chiller units B and C and pumps
17 B and C. And I guess I knew those were on there from
18 the emergency feedwater. I am asking about why A and
19 D are not on there.

20 MEMBER BLEY: Todd, you were going to tell
21 us about the process you go through, and I would be
22 interested in that because --

23 CHAIRMAN STETKAR: Yes, that is more
24 important.

25 MEMBER BLEY: You know, we had both the EJ

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1 things and the EP things, which are both judgment. And
2 how did you gain confidence that they did a thorough
3 job, given the documentation I have seen, but maybe you
4 saw more and deeper?

5 And I just had a thought. You know, when
6 we talked with the thermal hydraulic guys, they did some
7 comparison calcs on their own just to see if things line
8 up. Do you do anything like that? Do you go through
9 and say, "Gee, what are the things I would expect that
10 Expert Panel to find," and then look and see if they
11 have done some of that? So, if you could tell us a little
12 of the process, I think it would be helpful.

13 MR. HILSMEIER: Yes. If I could quickly
14 address --

15 MEMBER BLEY: Sure.

16 MR. HILSMEIER: -- for the chiller-ware
17 system, B and C trains are included; A and D are not.
18 There is a reason for that; I can't remember offhand.

19 CHAIRMAN STETKAR: No, I know why only B
20 and C are modeled because the only ventilation
21 water-cooling dependence that is explicitly modeled in
22 the PRA is cooling for the motor-driven emergency
23 feedwater pump rooms, which are the B and C rooms. A
24 and D, it is -- I have to be careful what words I use.
25 Room cooling is not modeled for the turbine-driven

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1 emergency feedwater pumps, which are the A and D pumps.

2 It is stated that those pumps will survive through the
3 PRA mission time without cooling for that room. I have
4 other questions about that, but those are PRA questions.

5 Given the fact, though, that the Expert
6 Panel, now the Expert Panel, added some systems that
7 were not modeled in the PRA because they felt they were
8 important -- and, in particular, for example, they added
9 the main control room ventilation system, which is,
10 indeed, cooled by essential chilled water. But the
11 panel did not add essential chilled water trains A and
12 D. They don't appear on here. Only B and C appear on
13 here.

14 So, that tells me that the Expert Panel must
15 have thought about chilled-water trains A and D and said,
16 "Oh, there is some reason they should not be on this
17 list, and here is the reason," beyond the fact that they
18 are not modeled in the PRA, because the HVAC, the main
19 control room HVAC system is not modeled in the PRA.
20 And yet, the Expert Panel folded that into the list.

21 And getting back to Dennis' -- I bring up
22 specific examples to kind of get people focused, but
23 I think we are more concerned about your process of
24 delving into that thought process --

25 MR. HILSMETIER: Right.

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1 CHAIRMAN STETKAR: -- you, as a reviewer
2 for Chapter 17.

3 MR. HILSMEIERS: I am sorry, Dennis, for not
4 addressing the question right away.

5 MEMBER BLEY: That is all right. You had
6 lots of things on your plate.

7 MR. HILSMEIERS: The approach we use for
8 identifying risk-significant SSCs, first of all,
9 studying and learning the design, the US-APWR design,
10 for this new plant for me. And then, studying and
11 learning the PRA models, what they modeled, what
12 information is available as far as RAW tables,
13 Fussell-Vesely tables, studying the assumptions made
14 in the model -- that is very important -- especially
15 the fault tree assumptions.

16 The data assumptions and the event tree
17 assumptions were somewhat important. I found the fault
18 tree assumptions were much more important because it
19 made assumptions about system alignments or train
20 alignments and what SSCs were considered inherently
21 reliable. And that is really not modeled in the PRA.

22 All that impacted how I looked at the RAP
23 list. And then, when I did the detailed review of the
24 RAP list, I also wrote out all of the systems of the
25 plant. And I will get to that, why I wrote the two lists

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1 of systems, in a little bit.

2 And so, as far as the PRA model, what we
3 looked at were the RAW Fussell-Vesely tables in the PRA,
4 making sure that all the RAWs and Fussell-Veselys exceed
5 the criteria of those SSCs that were included in the
6 RAP list. And that was a huge task because there was
7 like thousands. Actually, I used an Excel spreadsheet
8 to import all the RAWs and Fussell-Veselys and do
9 sorting. I did that for Revision 1 and Revision 2.
10 For Revision 3, I didn't do that detailed look at the
11 RAW and Fussell-Veselys because I am saving it for the
12 next revision because it is so intensive, and there
13 weren't enough changes in Revision 3 to justify looking
14 at all the RAW and Fussell-Veselys again.

15 I also looked at the PRA insights and
16 results. Those risk insights are very useful in
17 identifying SSCs that may be risk-important. And
18 again, looking at the PRA assumptions and the fault tree
19 assumptions was very valuable.

20 An example of the assumptions and use of
21 engineering judgment is for the essential service water
22 system trains, it was assumed that one of the strainer
23 trains were out of service, that the cross-tie valves
24 were closed, and the water is not flowing through it,
25 and the other train was in service.

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1 So, when the PRA model ran, the RAWs and
2 Fussell-Veselys for the train that is in-service were
3 very high; the RAWs and Fussell-Veselys for the trains
4 that were out of service was low. So, based on an
5 engineering judgment, Mitsubishi knew that the
6 out-of-service trains must have the same RAWs and the
7 Fussell-Veselys. So, they included those SSCs. That
8 is an example of the engineering judgment that they
9 applied.

10 So, we looked for things like that. We also
11 looked at the severe accidents, insights and
12 assumptions. Also, I spent a lot of time looking at
13 the risk-significant human interactions. In that, I
14 needed to go into understanding what components were
15 manipulated during those risk-significant given actions
16 to make sure those are included in the RAP list.

17 And then, also, Mitsubishi applied the
18 Seismic Margins Analysis identifying risk-significant
19 SSCs in their Seismic Margins Analysis. They applied
20 the NEI 00-04 document, which addresses risk
21 categorization for 50.69. They used the approach in
22 that document. So, I applied that approach to the
23 Seismic Margin Analysis, also to confirm the list.

24 My primary focus is looking for SSCs that
25 are not on the list that should be on the list. If an

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1 SSC is on the list and I feel it shouldn't be on the
2 list, that is okay; it is conservative. Mostly, we are
3 concerned about SSCs that are not on the list.

4 And so, as I discussed earlier, I created
5 a whole list of systems at the plant. And for any of
6 those systems that are not included in the RAP list,
7 I looked at and applied my 23 years of nuclear power
8 plant/PRA experience. And I worked at nuclear power
9 plants for 13 years -- no, actually, more than that.

10 You know, time flies.

11 (Laughter.)

12 CHAIRMAN STETKAR: It is really sad, isn't
13 it, when you start thinking about that?

14 MR. HILSMEIERS: I felt like as a kid that
15 a summer day would last forever. Nowadays the days fly
16 by.

17 (Laughter.)

18 So, at least 15 years, 16 years, 17 years,
19 working at nuclear power plants, working on
20 risk-significant lists because we did it for the
21 Maintenance Rule, and risk-ranking of valves. And I
22 applied by plant experience, my PRA experience, and
23 analyzed the systems that were not on the list and
24 determined whether or not they should be
25 risk-significant or not.

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1 I might have misunderstood you, John. You
2 were saying that the remote shutdown panel is not modeled
3 in the PRA? Am I correct on that?

4 CHAIRMAN STETKAR: You know, Todd, I didn't
5 go look at the hardware, but in the rationale for heat
6 up of the main control room --

7 MR. HILSMEIER: Right.

8 CHAIRMAN STETKAR: -- I read words that
9 said, "Well, the operators can always go to the remote
10 shutdown point."

11 MR. HILSMEIER: Right, right, right.

12 CHAIRMAN STETKAR: That, since the
13 ventilation system is not modeled, failures of the
14 ventilation system are not modeled, so there is nothing
15 in the PRA that says, if the ventilation system fails,
16 the operators have to go to the remote shutdown panel,
17 and what is the likelihood that they either do that or
18 don't do that successfully, you know? So, in that
19 sense, that whole evolution is not modeled in the PRA.
20 And yet, words are written saying, well, they could
21 do that.

22 MR. HILSMEIER: Right.

23 CHAIRMAN STETKAR: People could do a lot
24 of things that sometimes they do and sometimes they
25 don't.

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1 But, again, back to, I think, Dennis'
2 question, those are all specifics. I think you were
3 starting to talk about the process that you, in
4 particular, used to assure yourself that, if something
5 wasn't on the list, that it was reasonable that it was
6 not on the list.

7 MR. HILSMEIERS: And two other things that
8 I have done was look at RAP lists from previous design
9 certifications and just do a sanity check to see if those
10 lists included SSCs or systems that Mitsubishi didn't
11 include.

12 And lastly -- and this is a very important
13 part of the review of the list, because the people who
14 know the PRA the best are the Chapter 19 reviewers, Hanh
15 Phan, Marie Pohida -- Nick Soltis is no longer with us
16 today; he retired -- and Ed Fuller, he was a severe
17 accidents guy.

18 And when they reviewed Chapter 19, they were
19 very attentive of the RAP list and making sure that,
20 as they did review, that the RAP list captured important
21 SSCs, as they saw it. Based on that approach, I feel
22 that the RAP list that Mitsubishi has is effectively
23 complete.

24 And we did ask about RAIs, but, then, they
25 include some SSCs, and we provided justification why

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1 we thought it was risk-significant.

2 And also, comparing Mitsubishi's RAP list
3 other DC RAP lists, I feel this RAP list is much more
4 extensive than the others.

5 Regarding, Charles, the instrumentation
6 and controls, the instrumentation and control systems
7 were left at the system level. And that means all SSCs
8 inside the instrumental and control system are specific
9 in the RAP. They are involved certainly as far as PRA
10 modeling of digital I&C. And I felt that was the best
11 system, including the whole system into the RAP list.

12 Like the engineering safety feature system, the gas
13 system, the reactor protector system, the entire system
14 is in the RAP list.

15 Now, as far as how reliability performance
16 criteria, availability performance criteria would be
17 developed for SSCs in those systems, that would fall
18 under the Maintenance Rule. I am not familiar with how
19 the Maintenance Rule process right now is for the new
20 plants.

21 MEMBER BROWN: But that Maintenance Rule
22 is downstream of --

23 MR. HILSMEIER: Right.

24 MEMBER BROWN: -- the design process.

25 MR. HILSMEIER: Right. And it is through

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1 the Maintenance Rule that -- it is true that, under the
2 RAP program, building control manuals or like
3 pseudo-tech-specs are not developed for the RAP SSCs,
4 unless they are enriched. And the reason for that is
5 because the RAP guidance, as provided in SECY-95-132,
6 does not specify to provide these pseudo-tech-specs for
7 RAP SSCs.

8 They rely on the Maintenance Rule to ensure
9 that the reliability and availability of these SSCs are
10 maintained. Because under the Maintenance Rule, all
11 the RAP SSCs are declared high-safety-significant. And
12 therefore, they are given specific performance,
13 reliability/availability performance criteria, and
14 they are monitored against that criteria. And those
15 criteria are consistent with the PRA.

16 Me, personally, I think -- and this is just
17 my personal opinion -- I think it is a good idea to have,
18 since written SSCs to have pseudo-tech-specs, it would
19 be a good idea for RAP SSCs to be similar, to have
20 pseudo-tech-specs. That is just my personal opinion.

21 But, based on the current guidance given
22 to us by the Commission for RAP --

23 MEMBER BROWN: When was that issued?

24 MR. HILSMEIER: I believe 1995.

25 MEMBER BROWN: Okay. I mean, if you look

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1 at all -- that is blacksmith technology days. For the
2 civilian nuclear power industry, that is blacksmith
3 technology. I mean, you go out and pound a few
4 transistors or you have got switches and lights and
5 relays, and that kind of stuff.

6 Software falls so far outside that realm
7 of what I call "blacksmith technology" -- and I am not
8 saying that in a pejorative manner; I happen to like
9 a lot of blacksmith technology --

10 MR. HILSMEIER: Right.

11 MEMBER BROWN: -- from its reliability and
12 ease of understanding its ability to operate when you
13 want it to operate it and to test it and know that you
14 are going to get the right result.

15 But the software is different. And I
16 understand what the direction is, but, as we have
17 witnessed already in almost all the new design projects,
18 the requirements we look at, based on the Reg Guides
19 and even the Rule, 603, 1991 -- did I get the year right?
20 -- 1993, or something like that, those fundamental,
21 independence and the other issues that are encompassed
22 in that, and electrical independence, kind of gave you
23 a certain amount of inherit functionality independence.

24 With software and communication between
25 channels and performance of software, you don't get

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1 that. It is just absent. And so, at some point, you
2 have got to think about what do I do? In the absence
3 of formal processes that I have used in the past, how
4 do I do something now that gives me the performance and
5 reliability that I want out of the software-type
6 applications?

7 And I love those applications. They are
8 very, very, very good and give you a lot of flexibility
9 and allow you to do things with the plants that you
10 couldn't otherwise. But you still have to recognize
11 that it is different.

12 MR. HILSMEIER: Oh, yes.

13 MEMBER BROWN: And so, when you say, "Well,
14 this is all we are allowed to do" --

15 MR. HAMZEHEE: If I may, let me just help
16 Todd here.

17 MEMBER BROWN: I am not making that as a
18 nasty comment. That is not the point.

19 MR. HILSMEIER: No, I fully --

20 MR. HAMZEHEE: If I may, let me just help
21 my friend Todd there. You are right, these are not
22 unknown issues, and we had a lot of activities ongoing
23 with respect to digital I&C. But when he is working
24 on RAP, he is not trying to resolve all the issues that
25 are associated with digital I&C, but, rather, to make

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1 sure that at least on the RAP that system is defined
2 and enough attention will be given.

3 And as we learn more and develop more in
4 the area of software reliability, then at least that
5 system is appropriately identified. And when it
6 becomes the maintenance of digital I&C reliability, then
7 under the Maintenance Rule and other operational
8 programs, we are going to incorporate those into those
9 programs and, then, find out and make sure that we
10 monitor the reliability.

11 But we do not want someone like Todd -- or
12 on the RAP program, we try to resolve all the other issues
13 that we have with ongoing --

14 MEMBER BROWN: That is not what I am looking
15 for, my point being that the D-RAP program is set up,
16 at least based on what I understand from the multiple
17 meetings I have listened to this over the last few years,
18 to identify targets during the design stage that help
19 ensure that you have a reliable component or system,
20 whatever it is.

21 MR. HAMZEHEE: Yes.

22 MEMBER BROWN: And my concern is that, for
23 hardware-based things, there is a lot of clear targets.

24 You do this test; you do that. You test the materials.

25 There are all kinds of things you can do to what I call

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1 the blacksmith technology, okay, hammer and tongs and
2 metal and stuff like that, wire.

3 But for software, where is the oversight?

4 Where are the things for people to do in the design
5 stage that the NRC can be confident that these targets
6 that are set are set with respect to the technology with
7 which we are dealing, the software itself, the basic
8 operating system and the application code?

9 That is all I am trying to figure out. We
10 can't solve all those downstream issues, but how do you
11 set targets for these things where you all haven't just
12 passed it down -- and this is not a nasty, negative
13 comment -- where it has been passed into the process,
14 where it is all done at the vendor or the design guy
15 that is building the stuff and the applicant, or the
16 design agent that is overseeing the guy that is building
17 the stuff, without any understanding of what those
18 targets are by the NRC? Whereas, you know what those
19 are because you can quote all the ASME codes and
20 everything else that is cranked into the older
21 technology. That is my only point on this stuff. Okay?

22 MR. HAMZEHEE: Yes, I agree.

23 MEMBER BROWN: So, you can go on. You
24 answered my question. I just tried to articulate a
25 little bit of my thought process. I won't remember this

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1 tomorrow, but I am trying to get it into the transcript
2 today.

3 (Laughter.)

4 Well, that is the truth.

5 MR. HILSMEIER: I think that is all I had
6 to say about the approach.

7 MEMBER SCHULTZ: Todd, I would like to
8 follow up with regard to the approach. I appreciate
9 your description of the thorough review that was done
10 by several elements of the staff with regard to the
11 application.

12 And you mentioned that one of the results
13 of the work that was done by the staff was identification
14 of some additional items that ought to be incorporated
15 in the D-RAP.

16 MR. HILSMEIER: Uh-hum.

17 MEMBER SCHULTZ: And you provided that
18 listing to the applicant.

19 MR. HILSMEIER: Uh-hum.

20 MEMBER SCHULTZ: And in the applicant's
21 presentation, we didn't go over it in detail, but in
22 their presentation it was noted that, when they received
23 the list, they went in to review the items that were
24 provided, and they agreed to add to those to the list.

25 MR. HILSMEIER: Correct.

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1 MEMBER SCHULTZ: I am not sure what your
2 expectations were with respect to that, and that is what
3 I wanted to explore. In the thinking of a Quality
4 Assurance Program, my expectations would have been, if
5 I was the originating organization and I received such
6 a list from the reviewer suggesting that these
7 additional items be added, I would have put in my
8 corrective action program two things. One, an
9 evaluation of that list to determine whether each of
10 those should be added to the program, but I would also
11 add a corrective action program that would be
12 programmatic. In other words, given that an
13 organization, after all the work was done, identified
14 these additional things, was there something
15 programmatic that led me to provide an original list
16 that was not complete? In other words, that the
17 reviewing organization found lacking in some respects.

18 Now you have reassured that you really feel
19 that the list that was provided is exceptional, but I
20 am still wondering whether your expectations were that
21 that second element would also have been done by the
22 applicant; that is, to review their process to determine
23 why they didn't identify these themselves through the
24 process of their analysis, the Engineering Judge, and
25 the Expert Panel.

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1 MR. HILSMEIER: Yes, when I identify an SSC
2 that I think is risk-significant, my approach is in the
3 RAI I provide justification why I feel it should be
4 risk-significant, and then, see what the applicant's
5 response is.

6 And a handful of SSCs were added. Also,
7 there is a handful of SSCs that I thought should be
8 risk-significant, but the applicant justified that and
9 convinced me that they are not risk-significant. And
10 that is not reflected in the SER, just to keep the SER
11 more simplified.

12 Now this issue as far as applicants not
13 including certain SSCs in the RAP list is actually common
14 amongst other design certifications, and the reason
15 being is because NRC's expectations for RAP which is
16 in the current revision of SRP 17.4 is very unclear.

17 It is unclear as far as what the essential elements
18 of RAP are. It is unclear as far as how to identify
19 risk-significant SSCs. It is unclear to the staff.
20 It is unclear to the applicants.

21 As a result, Mitsubishi's application was
22 submitted based on that current SRP revision, and along
23 with the other design certifications. And so, the
24 unclarity of the SRP led to risk-significant
25 methodologies being broadly different amongst all the

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1 design certifications.

2 Like, for example, Mitsubishi didn't
3 initially include consideration of Seismic Margins
4 Analysis in identifying risk-significant SSCs. Now it
5 is NRC's expectation that they do include Seismic
6 Margins Analysis, but that wasn't in our guidance.

7 So, several years ago, we updated the SRP
8 through an Interim Staff Guidance to clarify to industry
9 what our expectations are in RAP, including what we
10 expect the applicant to look at in identify
11 risk-significant SSCs.

12 And actually, as a result of this ISG,
13 Mitsubishi, along with other DC applicants that were
14 still under review, updated their methodology to meet
15 NRC's expectations. In the process of updating this
16 methodology, new additional SSCs have been
17 communicated, I mean had to be added to the RAP list.

18 Now, in the case of Mitsubishi, I started
19 asking RAIs -- I communicated our expectations through
20 RAIs because the Interim Staff Guidance wasn't published
21 yet. It was on the verge of being published, but it
22 wasn't published yet. To avoid delaying the
23 communication of our expectations, through the RAIs,
24 I communicated our expectations. And a year or so
25 later, the Interim Staff Guidance was published.

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1 So, most of the SSCs that they added was
2 mostly due to clarification of NRC's expectations on
3 the RAP list. As I said, this was an issue across all
4 design certifications due to our unclear guidance in
5 SRP 17.4.

6 Now the Interim Staff Guidance on SRP is
7 now in the process of being incorporated into the SRP
8 17.4. In a few months, it will be released for public
9 comment.

10 But, just to summarize, much of the SSCs
11 that I requested, that I communicated to Mitsubishi that
12 should be included, I felt were the result of unclear
13 guidance, NRC guidance, in the SRP section.

14 MEMBER SCHULTZ: Then, in conclusion, do
15 you believe that the applicant has adequately satisfied
16 the process as you have gone through the RAI process
17 and provided that clarity to them --

18 MR. HILSMEIER: Yes.

19 MEMBER SCHULTZ: -- and that they are, if
20 you will, ahead of the game? In other words, what is
21 coming out in two or three months, that has been
22 addressed by this applicant?

23 MR. HILSMEIER: Correct.

24 MEMBER SCHULTZ: Thank you.

25 MR. HILSMEIER: I see you putting your

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1 glasses on, John.

2 (Laughter.)

3 CHAIRMAN STETKAR: Well, you know, no, you
4 are talking about getting old. Don't get me started
5 about vision and aging and getting depressed.

6 (Laughter.)

7 Let me ask, do any of the other members have
8 any questions for the staff?

9 (No response.)

10 Let me ask members -- what I was doing, we
11 don't normally see the RAIs. I always say this. And
12 we don't normally ask for the RAIs because, if we ask
13 for them, they are sent to us, and it simply adds, you
14 know, many, many more pages that we don't have enough
15 time to read.

16 In this particular instance, on pages 17
17 through 19 of the SER, there is a long list of RAI
18 questions that address specifically some of the issues
19 that we have been asking here in terms of they are the
20 RAIs that Todd was just mentioning regarding questions
21 to the applicant about specific SSCs that are on the
22 list, right? I am hoping that that list captures
23 everything. It is?

24 MR. HILSMEIERS: All the SSCs that we felt
25 were risk-significant got added to the list. There's

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1 a bunch of other SSCs that we thought may be
2 risk-significant, but Mitsubishi --

3 CHAIRMAN STETKAR: But at least this is the
4 list of RAIs that sort of captures that process --

5 MR. HILSMEIER: Yes, right.

6 CHAIRMAN STETKAR: -- that you were just
7 explaining?

8 Is there any interest among the members to
9 get copies of these RAIs and skim through them? I think
10 I would be interested. Girija or the staff, just go
11 through -- they are in bullet form, and some of the RAI
12 numbers are repeated. And I have no idea what volume
13 of material we are talking about, but I think we would
14 like to see those, if you could. That will give us at
15 least a little bit more of the detail of not only the
16 questions that the staff asked, but also the responses
17 that came back from HMI.

18 And, Todd, I think you said that in some
19 cases they had a good rationale for why something --

20 MR. HILSMEIER: Right.

21 CHAIRMAN STETKAR: -- ought not to be on
22 the list?

23 MR. HILSMEIER: Right.

24 CHAIRMAN STETKAR: So, that may help some
25 of our questions.

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1 MR. HILSMIEIER: Some of the RAIs, because
2 they are supplemental --

3 CHAIRMAN STETKAR: Oh, okay.

4 MR. HILSMIEIER: So, it gets confusing.

5 CHAIRMAN STETKAR: Well, that is why we
6 have people who can help sort that out for us.

7 (Laughter.)

8 If you could follow up, I think that would
9 be pretty useful.

10 MR. HAMZEHEE: We will get them to you.

11 CHAIRMAN STETKAR: Okay.

12 MEMBER BLEY: I think what I have
13 heard -- and I really appreciated your walking through
14 the process; that helps me out. It gives me more
15 confidence than I had before.

16 And I think what I have heard is that you
17 didn't rely so heavily on the applicant's description
18 of their Expert Judge and Expert Panel rationales as
19 on your own parallel review to see if you came up with
20 a similar list as they had or found differences. Is
21 that a fair statement?

22 MR. HILSMIEIER: In some of the RAIs I asked,
23 thought some SSCs were risk-significant, and they
24 responded back; they would use the PRA. Also, they
25 would use their Expert Panel.

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1 MEMBER BLEY: So, you actually saw more of
2 their rationales when you asked specific questions?

3 MR. HILSMEIER: Right, right.

4 CHAIRMAN STETKAR: That is why I thought
5 maybe the RAI's might ferret out a little bit more of
6 that exchange, provided they are not 2,000 pages of
7 material.

8 MEMBER BLEY: I guess where I was hanging
9 up is I have thought, I still think, that that process
10 has to be well-documented internally or somewhere. But
11 maybe reviewing that isn't as important as a parallel
12 process that looks for discrepancies and, then, digs
13 into specific cases. This might be the best way to go
14 at it. But I really hope they have the documentation
15 of that process in-house.

16 MR. HILSMEIER: Right. Part of the
17 essential elements of D-RAP is to maintain records.
18 As a result of your questions, I will be writing an RAI
19 to confirm that the Expert Panel looked at all
20 risk-significant SSCs.

21 I mean, based on this statement in the DCD,
22 I interpret it as --

23 CHAIRMAN STETKAR: All SSCs.

24 MR. HILSMEIER: Right. But, looking at it
25 when I was back in the audience, maybe I am

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1 misunderstanding the statements. I am going to ask for
2 an RAI for clarification on that.

3 And it may be a good idea to look at their
4 D-RAP records. I mean, we looked at their D-RAP
5 procedures. We had asked an RAI for them to not provide
6 the procedures because there was a lot of procedures,
7 but to describe their procedures in detail.

8 It may be a good idea to do an audit to
9 actually look at the procedures and look at their D-RAP.

10 MEMBER BLEY: It seems to me, I mean, we
11 have gotten into an area where it is not just this, but
12 other areas where we are almost licensing by process
13 rather than by direct examination, which makes me always
14 uncomfortable because within that process you may do
15 unusual things that get you into trouble. So, having
16 looked at those to make sure they are doing their process
17 the way they tell you seems an appropriate activity.

18 MR. HILSMEIERS: Right. Yes. I was on the
19 fence about doing an audit or not, but you have convinced
20 me enough that I should do the audit.

21 The other thing is there is, I don't want
22 to let the cat out of the bag, but there is a recent
23 design modification that will be discussed under Chapter
24 19. And I am just going to make sure to see how they
25 address that design modification in view of that.

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1 CHAIRMAN STETKAR: Cooling water or
2 others?

3 MR. HILSMEIER: Hydrogen igniters.

4 CHAIRMAN STETKAR: Oh. Oh, yes.

5 MR. HILSMEIER: The design modification.

6 And to see if that is addressed appropriately in D-RAP,
7 that is kind of like a test for me to see if they are
8 in the mini-D-RAP proposal or not.

9 CHAIRMAN STETKAR: Okay.

10 MEMBER SCHULTZ: It would be useful, as
11 Dennis has indicated, to provide a review to assure that
12 the guidance -- I presume there is guidance associated
13 with the documentation of the rationale, that the
14 follow-through is there.

15 MR. HILSMEIER: Right, yes.

16 MEMBER SCHULTZ: And the example you gave,
17 RAIs and responses are not good ways to document or
18 retain records. I mean, they are there in the record,
19 and it is indicated in the applicant's response that
20 they are going to incorporate what the result of the
21 dialog you have had through the RAIs into the program
22 description --

23 MR. HILSMEIER: Right.

24 MEMBER SCHULTZ: -- for the DCD. So, it
25 would be worthwhile to assure that that has been done

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1 appropriately to document the rationale.

2 MR. HILSMEIER: Right.

3 MEMBER SCHULTZ: And that would lead to
4 further reviews of other items also.

5 MR. HILSMEIER: Right.

6 MEMBER SCHULTZ: It could be very valuable
7 to make sure all of the rationale is appropriately
8 captured --

9 MR. HILSMEIER: Right.

10 MEMBER SCHULTZ: -- again, for
11 construction, operation, implementations.

12 MR. HILSMEIER: I agree.

13 CHAIRMAN STETKAR: Any members have
14 anything else for the staff?

15 (No response.)

16 If not, thank you very much.

17 What I would like to do, because there are
18 so many different topics and we are bouncing back and
19 forth between the design certification and the COL
20 application, I think what I am going to do is ask if
21 we have any public comments after each topic, so that
22 we don't stray too far afield before I ask for any kind
23 of public feedback.

24 Girija, you said that the bridge line is
25 open.

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1 MR. SHUKLA: Yes.

2 CHAIRMAN STETKAR: Do we know if we have
3 any members of the public on the bridge line.

4 MR. SHUKLA: No, it was only for MHI.

5 CHAIRMAN STETKAR: Only for MHI? Okay.

6 If that is the case, then I will ask, are
7 there any members of the public in the room that have
8 any comments or questions you would like to make
9 regarding, in particular, the topic of the design
10 certification, Chapter 17?

11 (No response.)

12 If not, thank you very much.

13 MR. HILSMEIER: Thank you.

14 CHAIRMAN STETKAR: You also weathered the
15 storm rather well.

16 And what we will do is we will recess, and
17 I am going to be difficult about this, until 10:40.

18 (Whereupon, the above-entitled matter went
19 off the record at 10:26 a.m. and resumed at 10:41 a.m.)

20 CHAIRMAN STETKAR: Okay. We are back in
21 session.

22 Now we are going to hear about Chapter 17
23 of the Combined License Application. And as I
24 understand it, we have the bridge line open now. Is
25 that for people from Luminant or do we know we have

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1 members of the public on the line.

2 MR. WOODLAN: We have one individual from
3 MNES who may jump as necessary.

4 CHAIRMAN STETKAR: Okay. It is just to
5 orient me when I go ask for public comments and things
6 like that. So, thank you very much.

7 And you said it is open all the way?

8 MR. SHUKLA: Yes.

9 CHAIRMAN STETKAR: So, whoever the person
10 on the other end, please be very careful. Either mute
11 your phone or just be very, very quiet because we have
12 a very, very sensitive sound system here. When you make
13 any sounds out there, it kind of explodes on this end
14 and it really wreaks havoc with our court reporter.
15 So, if you could try to be as quiet as you can, unless
16 we ask questions. Thank you.

17 MR. HICKS: I understand.

18 CHAIRMAN STETKAR: Don, it is all yours.

19 MR. WOODLAN: Thank you.

20 Good morning, everyone.

21 I am Don Woodlan. I am the Luminant
22 licensing lead for Comanche Peak Units 3 and 4. It is
23 a pleasure to be back here again making more briefings.

24 We are here today to cover Chapter 17. We
25 have Ron Carver who is the Luminant QA lead for Comanche

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1 Peak Units 3 and 4, and we have John Conly who is the
2 Luminant COLA Manager for Comanche Peak Units 3 and 4.

3 And we have several individuals from Mitsubishi in the
4 audience who are here to support us if we need help on
5 some of these questions. And as mentioned, we have Tom
6 Hicks, also representing MNES, who is on the telephone.

7 With that, I am going to turn it over to
8 Ron, who is going to start the presentation for us.

9 MR. CARVER: Thank you, Don.

10 Well, good morning, everyone.

11 I am Ron Carver, and I will begin with our
12 standard agenda, which includes an introduction, a
13 proposed license condition, and topped-off with
14 site-specific assets. So, let us begin with the
15 introduction.

16 This chapter of the Comanche Peak FSAR uses
17 the "incorporated-by-reference" methodology, of which
18 there are no departures from the US-APWR Design Control
19 Document. All COL items are addressed in the FSAR.
20 The Chapter 17 Safety Evaluation Report does not contain
21 any open or confirmatory items. We do have one proposed
22 license condition to cover, and I am pleased to say we
23 have no contentions pending before the ASLB.

24 As I said, the NRC did propose one license
25 condition for Chapter 17 which states, "No later than

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1 12 months after issuance of the COL, the licensee shall
2 submit to the Director of NRO a schedule that supports
3 planning for, in conduct of, NRC inspection of the
4 Maintenance Rule Program. The schedule shall be
5 updated every six months until 12 months before
6 scheduled fuel loading and every month thereafter until
7 the Maintenance Rule Program has been fully implemented.

8 Luminant has previously placed in Part 10
9 default proposed license conditions, in an effort to
10 address all operational programs, including the NRC
11 proposal or Maintenance Rule we just discussed. Our
12 proposal states, "The licensee shall submit to the
13 Director of NRO a schedule no later than 12 months after
14 issuance of the COL or at the start of construction,
15 as defined in 10 CFR 50.10(a), whichever is later, that
16 supports planning for and conduct of NRC inspections
17 of operational programs listed in FSAR Table 13.4-201,
18 with the exceptions of the Fitness-for-Duty Program.

19 The schedule shall be updated every six months until
20 12 months before scheduled fuel loading and every month
21 thereafter for each applicable operational program
22 until either the operational program has been fully
23 implemented or the plant has been placed in commercial
24 service, whichever comes first."

25 Okay. Moving on to site-specific assets,

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1 Section 17.1 and 17.2 are really just pointers to the
2 Quality Assurance Program spelled out in Section 17.3
3 and 17.5.

4 Section 17.3 states, "Luminant is
5 responsible for establishing and implementing a Quality
6 Assurance Program for design, construction, and
7 operations, and that we have delegated quality-related
8 work to others, but ultimately retain responsibility
9 for the QA Program."

10 Our Quality Assurance Program for
11 preparation to review the COLA is governed by the NuBuild
12 Quality Assurance Project Plan, which invokes elements
13 of our two operating units' Quality Assurance Program.

14 This program is based on ANSI N45.2 and meets the
15 requirements of 10 CFR 50, Appendix B, requirements.

16 Now Luminant, the safety-related contract
17 has required our primary contractor to have a Quality
18 Assurance Program based on NQA-1 and to meet the 10 CFR
19 50, Appendix B, requirements along with Part 21.

20 MEMBER BROWN: Excuse me. By "primary
21 contractor," do you mean the --

22 MR. CARVER: MNES.

23 MEMBER BROWN: MNES?

24 MR. CARVER: Yes, sir.

25 MEMBER BROWN: Okay. Thank you.

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1 They got the design, the plant design
2 contractors.

3 MR. CARVER: Yes.

4 MEMBER BROWN: Okay.

5 And at this time, I will turn it over to
6 John to discuss Section 17.4

7 John?

8 MR. CONLY: Thank you, Ron.

9 As we discussed earlier this morning, the
10 US-APWR D-RAP is implemented in phases. The first is
11 the design certification phase; Phase II,
12 site-specific, and the third phase, procurement
13 fabrication, construction, and pre-operational testing
14 program or phase. Phases II and III programs continue
15 the structure and quality controls put into place in
16 Phase I by MNES/MHI, and Phases II and III will be
17 complete before fuel load. Luminant is responsible for
18 the D-RAP Phases II and III and for the Operational
19 Reliability Assurance Program.

20 The only site-specific Phase II
21 risk-significant SSCs are the UHS cooling tower fans,
22 as presented in FSAR Table 13.4-201.

23 MR. WOODLAN: Seventeen.

24 MR. CONLY: I'm sorry, 17.4-201. Thank
25 you.

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1 The Operational Reliability Assurance
2 Program will be conducted by the System Engineering
3 Department and Maintenance Engineering Department in
4 combination. The Operational Reliability Assurance
5 Program will be integrated into the Maintenance Rule
6 Program as well as other operational programs, such ISI,
7 IST, and reactor vessel material surveillance programs.

8 Are there any questions?

9 MEMBER SHACK: Will you do your own review
10 of the Maintenance Rule Program for components or are
11 you going to assume the D-RAP list essentially gets
12 everything that should be in the Maintenance Rule?

13 MR. CONLY: We have IDRed the D-RAP from
14 the US-APWR, and this is the only addition.

15 CHAIRMAN STETKAR: John, go back -- I am
16 sure you were listening intently to our questions of
17 MHI and the staff. Since you are now responsible for
18 procurement and installation of all of the equipment,
19 on the D-RAP list right now that has been reviewed and
20 accepted by the staff, and unless anything changes, the
21 only information we have is it is complete. There are
22 line items like main feedwater system. How are you
23 going to address that in your procurement process? Does
24 that mean a drain valve problem, some main feedwater
25 heater, because it is part of the main feedwater system,

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1 will be assigned higher quality requirements during your
2 procurement of that drain valve? Because the whole
3 system is in there. That tells me everything from the
4 outlet of the condenser to the inlet to the steam
5 generator is in the D-RAP program.

6 MR. CONLY: And I would have to say that
7 in Phase II we will use our prime contractor, MNES, to
8 develop all of that program for us.

9 CHAIRMAN STETKAR: But, right now, I am
10 trying to address this kind of thing we are struggling
11 with of how is that list, that table that is in the
12 certified design that I have been reminded is part of
13 the D-RAP list transition to you now, the applicant,
14 who must actually go out and buy this equipment and
15 install in the plant and test it and maintain it as part
16 of the what you are calling Phase II and Phase III or
17 the transition from the design to the operational
18 programs, because right now you have accepted, by
19 reference, that table in the design certification, which
20 to me says every bit of equipment that is associated.

21 Now I am assuming it is also the main condensate system
22 because it is hard to get feedwater from the condenser
23 to the steam generators without main condensate,
24 although only main feedwater is listed. How do you
25 resolve all of that?

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1 MR. WOODLAN: Let me take a shot at it.
2 The basic answer is we don't have those procedures and
3 processes in place yet. So, I can't give you an absolute
4 answer. I can say that, for sure, the D-RAP list,
5 including, as you say, some very general items, is the
6 starting point. The end point is probably this D-RAP
7 and the Maintenance Rule at the other end, and the work
8 in between is really new. Applying this approach to
9 the procurement, fabrication, construction process is
10 something that we will have to take on.

11 I believe we will adopt processes and
12 procedures very similar to what we use in the Maintenance
13 Rule area. We will be looking at, as we are developing
14 the procurement, pretty much, I assume, most, let's say
15 the safety-related component; the specs will be there
16 in the DCD and the FSAR of how we should be applying
17 that, and it will be a full Appendix B QA Program. And
18 that is how we will enter maintaining the quality for
19 a given component, assuming it is a typical
20 safety-related component.

21 CHAIRMAN STETKAR: That's safety
22 component, but --

23 MR. WOODLAN: Yes.

24 CHAIRMAN STETKAR: -- but I am talking
25 about this amorphous stuff called the main feedwater

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1 system, for example.

2 MR. WOODLAN: And you are absolutely right;
3 that will be a bigger challenge. I can only look at
4 what we do in the Maintenance Rule arena today. We have
5 that same challenge in the operating plants where we
6 are implementing the Maintenance Rule. And we
7 generally know the range of components we are dealing
8 with, and we usually look at trigger or trip wires that
9 kick us into reliability questions. Either we get
10 condition reports that indicate there have been
11 challenges in the plant, the equipment has had failures,
12 and we start evaluating those against the reliability.

13 And when that happens, we will bring in whatever tools
14 we need, including PRA, Expert Panel, typically, what
15 is required for the Maintenance Rule.

16 Now how we are going to apply that to the
17 non-safety components during the procurement and
18 construction phase, I don't have the answer to that yet.

19 We will need to develop those processes.

20 CHAIRMAN STETKAR: Is that process -- and
21 I probably should be asking the staff rather than you
22 because I am not familiar with the details of the
23 process -- are those decisions made, in other words,
24 is what I will call the O-RAP list, which from what you
25 are saying probably has more specificity than the D-RAP

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1 list. And I will use this main feedwater system as an
2 example.

3 MR. WOODLAN: Well, yes, we will start with
4 the current list, but it will evolve as we go and become
5 more specific, yes.

6 CHAIRMAN STETKAR: But is that O-RAP list
7 generated and examined by the staff before the COL is
8 issued or is that after issuance of the COL? That is
9 my question. It is a process question.

10 MR. WOODLAN: I believe they are not
11 staff-approved, if you will, but they are inspected,
12 just like they do for the operating plants. In fact,
13 it gets a lot of inspection attention, and I suspect
14 we have to have the program in place, as we say in the
15 last slide there.

16 But it doesn't require NRC approval. I
17 expect it will be a significant part of the inspection
18 programs as we approach fuel load.

19 CHAIRMAN STETKAR: But that is after
20 issuance of the COL?

21 MR. WOODLAN: That is after issuance of the
22 license.

23 CHAIRMAN STETKAR: It is not a --

24 MR. WOODLAN: Yes.

25 CHAIRMAN STETKAR: -- requirement for

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1 issuance of the COL --

2 MR. WOODLAN: Correct.

3 CHAIRMAN STETKAR: -- that any more detail
4 than what is currently shown on the D-RAP --

5 MR. WOODLAN: Yes.

6 CHAIRMAN STETKAR: -- is available? Okay.

7 Thank you.

8 MR. WOODLAN: Well, let me expand one more
9 area. I was thinking about this as the DCD was making
10 their presentation. How we would do this
11 implementation, and again, looking back at what we have
12 done in other areas.

13 What I suspect is, as we are looking at
14 fabrication, design, and construction for the
15 non-safety components, in the past we have done things
16 like someone mentioned the special treatments of Part
17 69, and we have also looked at what we call an augmented
18 quality program. In fact, I think we specifically
19 mention that in the FSAR.

20 So, there are some tools that exist there
21 in the industry, and we have used them at Comanche Peak.

22 It is my belief that we will probably bring those tools
23 into these processes as we develop them.

24 MR. HICKS: Hey, Don, this is Tom. Can I
25 just say one thing?

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1 CHAIRMAN STETKAR: Yes. Tom, make sure
2 you state your full name, so that we have it on the
3 record.

4 MR. HICKS: Sure. This is Tom Hicks with
5 MNES.

6 CHAIRMAN STETKAR: Thank you.

7 MR. HICKS: Just one other thing I want to
8 add is that all the risk-significant items -- and this
9 is described in the DCD as well -- that are non-safety
10 related do get the augmented quality controls applied,
11 and those are described in Part 3 of the Quality
12 Assurance Program description.

13 CHAIRMAN STETKAR: Thank you.

14 MR. HICKS: So, the safety-related things
15 get the Appendix B program; the non-safety,
16 risk-significant get the Part 3 quality controls from
17 the QAPD.

18 MR. WOODLAN: Thank you, Tom.

19 CHAIRMAN STETKAR: We understand that,
20 but, from our purposes right now, if I were to understand
21 the D-RAP list and what I just heard, they would tell
22 me that every vent and drain valve from every piece of
23 piping along the entire main feedwater path will have
24 that augmented quality applied to it.

25 MR. WOODLAN: I guess I wouldn't assume

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1 that. I would say it would be evaluated for augmented
2 quality. As we are developing the detail design, the
3 procurement, fabrication details, we will make that
4 assessment: does it need augmented quality and, if so,
5 we would add it.

6 MEMBER SHACK: Yes, and in what respect?

7 I mean, it is a typical 50.69 kind of a questioning.

8 MR. WOODLAN: Yes.

9 MEMBER SHACK: And there is guidance for
10 that, which I assume will look a whole lot like the
11 guidance you will --

12 MR. WOODLAN: Yes, I agree.

13 CHAIRMAN STETKAR: Okay. Thanks, Don.

14 MR. WOODLAN: Are there other questions?

15 MEMBER BROWN: Yes.

16 MR. WOODLAN: Please.

17 MEMBER BROWN: I am trying to understand
18 a little bit -- and this carries over from the previous
19 discussion, so I just love to mouth-note this
20 stuff -- the reactor trip system is a system that you
21 will be procuring. And I presume you will be procuring
22 that, then, through MNES? Is that -- based on your
23 previous comments?

24 MR. WOODLAN: Yes, yes.

25 MEMBER BROWN: So, they are your primary

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1 contractor?

2 MR. WOODLAN: That is correct.

3 MEMBER BROWN: There is a set of design
4 certification requirements that, once the NRC approves
5 and issues the license, that are incorporated in the
6 DCD that, then, have to be passed down to the vendors.

7 And then, the MNES will then, I guess, approve the
8 design as it is developed by the vendors, so that it
9 meets the architecture and the rest of the output and
10 other type requirements that are specified in the DCD.

11 Now that is part of the design program.
12 You make two comments in here, if you go back to -- let
13 me get the right slide. No, maybe it is the wrong slide.

14 Luminant is responsible for establishing/
15 implementing the QAP for design, construction, and
16 operation. You have delegated work that retained
17 responsibility.

18 I guess my question here is relative to the
19 PSMS or the reactor trip SFAS and the rest of the systems
20 that come under that hierarchy, is that going to be
21 relative, since you have delegated that to MNES in terms
22 of procuring it, designing it, testing it? Is that a
23 turnkey back to you? I mean, in other words, they design
24 it and they say, "Okay, now we have built in accordance
25 with this. Here it is. Go put it in and have fun."?

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1 Or does your Quality Assurance Program actually provide
2 an oversight of the MNES development process to ensure
3 that they actually incorporate the design details that
4 are critical to the performance of those systems?

5 MR. WOODLAN: Let me try to answer that.

6 MEMBER BROWN: Was I clear, No. 1?

7 MR. WOODLAN: I believe so. I think I
8 understand.

9 First of all, let me say, although
10 Mitsubishi/MNES is probably going to be the contractor,
11 as you say, we don't have contracts in place yet.

12 MEMBER BROWN: No, it is just an example;
13 that's all.

14 MR. WOODLAN: Yes. I am just trying to be
15 clear on that point.

16 But whoever it is, whoever our prime
17 contractor is, I would hesitate to use the word
18 "turnkey". We have never done it that way at Luminant,
19 and I don't believe we will ever do it that way in the
20 future.

21 Just like we are doing now with the FSAR,
22 we use MNES as our prime contractor. They do a
23 tremendous amount of work, but we do maintain oversight
24 of what they would do. We interject ourselves where
25 we feel it is appropriate, and we make sure we understand

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1 at an appropriate level what is going on and we agree
2 with the approach.

3 So, I suspect that that will be the process
4 going forward as well. The technical expertise, the
5 background will probably be with our prime contractor.

6 The MNES will maintain a staff that does
7 not oversight that and confirms that we are comfortable
8 with what they are doing. Even in the I&C area today,
9 in the design area, we have maintained an oversight.

10 MEMBER BROWN: Luminant has?

11 MR. WOODLAN: Luminant has maintained an
12 oversight of the DCD work, because it is so important
13 going forward, and has advised and reviewed what
14 Mitsubishi is doing to make sure that we are comfortable
15 with it and that we have our input.

16 MEMBER BROWN: And the reason I ask is that
17 we haven't done Chapter 7 yet as part of the DCD. That
18 is still an upcoming task.

19 MR. WOODLAN: Yes.

20 MEMBER SHACK: Treat.

21 (Laughter.)

22 MEMBER BROWN: Treat, yes.

23 And if you have at least absorbed, or if
24 the staff has passed information that run through the
25 previous new projects that have gone through, you can

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1 probably anticipate some questions and desire for
2 certain information to be available in the DCD that
3 addresses the newness of the application of
4 computer-based systems using CPU-type platforms.

5 And so, if architectures are very, very
6 important in order to maintain the performance and the
7 reliability in the reactor trip and SFAS systems, I mean
8 some things such as watchdog timers and other type things
9 which would initiate trips in certain trains if
10 everything locks up are critical and have been addressed
11 in previous designs.

12 My question is, how deep do you go in terms
13 of looking at those. I mean, you say you have a staff
14 at Luminant that oversees the MNES, MHI, whoever it is.

15 Is that just a process review or is it actually a real
16 hardware review as well, part of our software review
17 in terms of the digital I&C?

18 MR. WOODLAN: I don't think there is a
19 simple answer to that because, just like we have done
20 here thus far in the application part, we vary our depth
21 of review and our detail of review based on, first of
22 all, what value we think we can add to the process and
23 where we think there are challenges that we should be
24 aware of and that we can participate in.

25 So, in the case of I&C, we have had an

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1 individual who has spent ultimate time. Now I don't
2 know all the details, so I can't answer which details
3 that we actually got into. But I know we participated
4 in most of the public meetings, a lot of the audits,
5 and we looked at a lot of the material.

6 If something affects operations like tech
7 specs, we did a lot and we went very deep because those --

8 MEMBER BROWN: I am looking at tech specs.

9 I mean, there are lists and lists of when you do these
10 checks and that check.

11 MR. WOODLAN: Yes.

12 MEMBER BROWN: But I am looking at the QA
13 Program itself in terms of how you take delivered systems
14 and the architecture of those systems, and their
15 compliance with DCD, not necessarily how each software
16 line is done or sensor, or how many wires can from Point
17 A to Point B, and all that kind of stuff, but fundamental
18 principles such as independence, redundancy, all those
19 types of things that you can look at without being a
20 designer, for instance, that are supposed to be
21 incorporated in the design in terms of how it is set
22 up and designed.

23 So, there is some level, it seems to me,
24 of technical understanding of the system you are getting
25 that Luminant should have to ensure that it at least

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1 meets whatever the final license certification approves
2 from the NRC. And staff won't be doing that; you all
3 will be doing that. Maybe they will be auditing you,
4 but that is a different -- I am not working on the audit
5 part of the NRC, just your responsibility.

6 Just because you have talked about this
7 differentiation of delegating certain things, which I
8 understand -- I don't disagree with -- but it is a matter
9 of matter sure you get what you have ordered. And that
10 is why I asked the question.

11 MR. WOODLAN: Okay. And again, I am going
12 to have to be kind of general. I may ask for some help
13 here. But I can go back to what was done on 1 and 2.

14 Now it is not digital, but it is similar, having to
15 get into the depth of detail.

16 In the early stages in the procurement and
17 the design, Luminant was not intimately involved, let
18 me say. Again, it was a very high-level overview. But,
19 as you proceed through the receipt, the testing, the
20 verification, Luminant becomes more and more involved.

21 And by the time you get to the end-point where you are
22 doing the pre-operational testing and the startup
23 testing, then Luminant is intimately involved. And I
24 suspect that is exactly what will happen on 3 and 4.

25 MEMBER BROWN: Okay, but there is some

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1 design-type characteristics, such as independence,
2 which you don't really -- by the time you get to the
3 pre-operational test, it is too late. If the design
4 doesn't compensate --

5 MR. WOODLAN: I understand.

6 MEMBER BROWN: -- for certain failure
7 modes, it is too late by then, okay? So, that is kind
8 of my question. It is a leading question.

9 For instance, if all your processors lock
10 up in the reactor trip system, you ought to SCRAM the
11 plant, fundamentally. You ought to shut down. Now that
12 has been the discussions in previous design
13 certification discussions, and that will probably be
14 a part of the discussion in the upcoming Chapter 7
15 review.

16 So, my point being that there are certain
17 architectural features that, once you get the
18 pre-operational checks, it is installed in the plants
19 and the wires are run, it is too late. You now have
20 a system that is fundamentally not suitable for
21 operation. You can't change it without a lot of
22 difficulty in cost.

23 MEMBER SHACK: So, won't those issues be
24 dealt with in the design certification?

25 MEMBER BROWN: Well, it is in the DCD.

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1 Hopefully, it is will be specified, but it is a matter
2 of Luminant making sure that MNES delivers that feature
3 in the design. They don't have to go down to the nuts
4 and bolts, but does it meet these particular high-level
5 requirements?

6 And so, I was just trying to probe to see
7 a little bit about what your all's technical level of
8 involvement is.

9 MR. WOODLAN: Well, it is my projection
10 that the testing we do will be to confirm that those
11 key elements are in there and are working.

12 MEMBER BROWN: By the time do it, it is
13 installed in the plant, it is too late. I guess that
14 is my only --

15 MR. WOODLAN: Well, I would disagree that
16 it is too late. If it is wrong, if it is broken, if
17 it doesn't do, we will fix it. We will have to do
18 something to fix it. We won't operate a plant that
19 doesn't do what it is supposed to do.

20 MEMBER BROWN: Well, I wouldn't think so,
21 but --

22 MR. WOODLAN: We will do it.

23 MEMBER BROWN: All right. Well, that is
24 enough. I have beat this horse to death.

25 MEMBER SCHULTZ: But let's back up a bit

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1 because you mentioned, Don, that the implementation plan
2 is something that you expect MNES, or whoever it is going
3 to be, to develop, that it is not developed now. It
4 needs to be developed for the reliability assurance
5 program and to go into the next phase and procurement
6 and construction, and so forth.

7 MR. WOODLAN: There is an area where I
8 suspect Luminant will have a lot of involvement, the
9 development of a plan and the process.

10 MEMBER SCHULTZ: And that is what I wanted
11 to hear.

12 MR. WOODLAN: Is that what you are talking
13 about? Yes.

14 MEMBER SCHULTZ: I didn't hear that when
15 you first mentioned it.

16 MR. WOODLAN: Yes. Okay. I'm sorry.

17 MEMBER SCHULTZ: You said that it hadn't
18 been developed and MNES was going to be given some part
19 of that task, is what I am hearing now.

20 MR. WOODLAN: And they will, but, much like
21 we have done here in the application phase, many
22 activities, like how we write the FSAR, how we amend
23 the FSAR, we looked to MNES, as our contractor, and said,
24 "Give us a procedure that says how this is going to
25 happen." But, then, Luminant, because of the

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1 importance of that going forward, did get intimately
2 involved in reviewing that procedure, making sure that
3 we felt this process was going to support what was needed
4 and making comments at getting the procedure revised
5 until both parties were satisfied.

6 And I suspect that is exactly what will
7 happen on the key processes here, on how we are going
8 to handle D-RAP, how we are going to handle this
9 augmented quality going forward. We will turn to our
10 prime contractor and say, "Tell us how you are going
11 to do that." We will review that closely, make sure
12 we are onboard and we are comfortable that that will
13 achieve the purpose.

14 MEMBER SCHULTZ: So, we had talked earlier
15 this morning about the documentation that is being
16 developed and now available to identify the rationale
17 and the expectations with regard to the SSC equipment,
18 and coming out of the design-related program, the PRA
19 and the Expert Panel, and the other areas that have
20 contributed to that listing.

21 Do you feel comfortable with the
22 documentation that has been developed to move forward
23 with the implementation plan?

24 MR. WOODLAN: Do I feel comfortable?

25 MEMBER SCHULTZ: Yes.

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1 MR. WOODLAN: We were just talking about
2 that, another gentleman from Luminant, Todd Evans and
3 I, while Mitsubishi was making their presentation. We
4 have an ongoing interaction with Mitsubishi about what
5 documentation will be turned over and/or available to
6 Luminant when we move forward.

7 MEMBER SCHULTZ: Good.

8 MR. WOODLAN: And we were saying this is
9 something that we clearly want to make sure is on that
10 list of documentation that is available. We don't know,
11 as was discussed this morning, exactly what form that
12 will be in. Hopefully, it will be in a form that is
13 easily acceptable, so that, as our Expert Panel moves
14 in and we start dealing with these challenges, we will
15 be able to go back and find out what the basis was.
16 Anybody that has worked in licensing knows, to make a
17 change, you have got to know why it was there in the
18 first place.

19 MEMBER SCHULTZ: Right, right.

20 MR. WOODLAN: And that is a key of what
21 those discussions were and what that documentation will
22 have in it. Unfortunately, frequently, this
23 documentation is in the form of minutes of the Expert
24 Panel, which makes it difficult to delve into. But we
25 have dealt with that before. And if that is what it

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1 is, we will find a way to make that more accessible and
2 readable.

3 MEMBER SCHULTZ: We can see that this is
4 a very important handoff.

5 MR. WOODLAN: Yes, we agree.

6 MEMBER SCHULTZ: Especially when it is one
7 organization to another. And so, I am glad those
8 discussions have already happened and will continue.

9 MR. WOODLAN: Well, it is in process. They
10 are continuing, yes.

11 MEMBER SCHULTZ: Thank you.

12 MR. CONLY: Are there other questions?

13 (No response.)

14 Let me turn it back to Ron to continue the
15 discussion of the Quality Assurance Program.

16 MR. CARVER: Thanks, John.

17 Section 17.5 discusses the implementation
18 of the Quality Assurance Program and how we will
19 transition, on issuance of the COLA and as the project
20 progresses, from the Quality Assurance Project Plan to
21 the Quality Assurance Program description that is
22 provided in Part 11. When that has committed, then we
23 will fully transition to the QA Program description no
24 later than 30 days prior to fuel load.

25 The nuclear operations for Comanche Peak

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1 Units 3 and 4 will be governed by the fully-implemented
2 QA Program description, which is based upon NEI 06-14A.

3 Any questions on that section?

4 MEMBER SCHULTZ: One question, Ron. The
5 words that you have used are typical in terms of "no
6 later than 30 days prior to fuel load".

7 MR. CARVER: Sure.

8 MEMBER SCHULTZ: But in terms of Luminant's
9 thinking, do you have a different target than what is
10 qualified here for latest to be done?

11 MR. CARVER: Well, that is a variant
12 answer. There are several programs, at least 22
13 operational programs that we don't have listed.

14 MEMBER SCHULTZ: Right.

15 MR. CARVER: They will be implemented as
16 we go along and just prior to needing them. We want
17 to have some of these a little bit more mature when we
18 implement them. So, it really depends on the particular
19 program we are talking about. So, over probably a
20 three-year period that we are developing our staff with
21 the operational piece, those people will come in, write
22 those, put them together.

23 So, yes, our intent would be sometime before
24 30 days prior to fuel load. That will probably be a
25 moving target as we get closer, but it will be varying

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1 dates, probably three years out up to that date.

2 MEMBER SCHULTZ: Okay. You mentioned a
3 couple of things, and certainly in terms of the
4 programmatic element, but you are likely to require not
5 only -- and it is part of this program -- but you are
6 requiring not only the documentation, but also the
7 personnel training and development --

8 MR. CARVER: Absolutely.

9 MEMBER SCHULTZ: -- and positioning
10 associated with having an executable program on the
11 ground running at 30 days prior to. So, that is all
12 in your planning?

13 MR. CARVER: That is just an absolute
14 drop-dead date.

15 MEMBER SCHULTZ: Okay. Thank you.

16 MR. CARVER: Okay. Anything else?

17 (No response.)

18 Okay. This subsection incorporates by
19 reference the NEI 07-02A document that is entitled,
20 "Generic FSAR Template Guidance for Maintenance Rule
21 Program Description". This is a mature industry
22 program that we are familiar with. There are operating
23 units. And we plan to leverage this experience as we
24 move into operations at the new units.

25 So, this really concludes all of the Chapter

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1 17 presentation, unless there are some more questions.

2 CHAIRMAN STETKAR: Any members have any
3 questions for Luminant?

4 (No response.)

5 If not, thank you very, very much. We
6 appreciate it.

7 MR. SHUKLA: Tom, are you still on the
8 phone?

9 MR. HICKS: Yes.

10 MR. SHUKLA: Yes, this is Girija Shukla
11 from the ACRS. Do you plan to be on the phone later
12 today or tomorrow, or you are done?

13 MR. HICKS: I will probably be on the
14 afternoon session today.

15 MR. SHUKLA: Okay. All right. Thank you.

16 MR. HICKS: You're welcome.

17 CHAIRMAN STETKAR: Thank you.

18 We will have the staff come up for their
19 lengthy presentation.

20 (Laughter.)

21 This has to be really important if Stephen
22 is actually going to run the slides for us.

23 (Laughter.)

24 Tarun, just be really careful of not hitting
25 that microphone. They are really, really sensitive.

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1 Thank you.

2 MR. ROY: That's right.

3 Okay. We are starting again this Comanche
4 Peak Nuclear Power Plant COLA application review for
5 Chapter 17. Or maybe I should elaborate on the program.

6 I am Tarun Roy, and I gave you my brief
7 biographical last time. And here we have Todd again
8 for PRA and the Severe Accident Branch, and Greg Galletti
9 is absent. But Branch Chief Kerri Kavanagh will support
10 that for 17.5, which is a Quality Assurance Program.

11 This is another place we have no open items.

12 As I said, it is Chapter 17.

13 So, any PRA questions for PRA-related
14 targets here again?

15 (Laughter.)

16 The same team; we can repeat that maybe.

17 (Laughter.)

18 CHAIRMAN STETKAR: I hate to let you guys
19 just sit here with three slides and say nothing. So,
20 let me see what I can shoot from the hip a little bit.

21 (Laughter.)

22 There is a requirement that says, by the
23 time of the fuel load, there must be -- I don't know
24 what term is used -- let me call it a plant-specific
25 PRA that is developed to satisfy all of the standards

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1 and guidance that are in effect one year prior to fuel
2 load. I probably paraphrased that incorrectly, but you
3 get the message.

4 There are also a lot of statements, and we
5 will address those in more detail when we talk about
6 the PRA, that say, well, there were many key sources
7 of uncertainty -- and I think that is the term that is
8 used -- identified in the Design Certification PRA that
9 the COL licensee or applicant, I am not sure which, will
10 need to address before you can actually use the PRA for
11 anything.

12 Those refinements of the PRA, whenever they
13 are done, could, in principle, affect the population
14 of the -- I will just call it the RAP list for now because
15 I am not quite sure which one it means. It is certainly
16 not the D-RAP list because that is finalized, which could
17 obviously affect the programs that the licensee puts
18 into place in terms of procurement, quality for
19 procurement, and everything that we have been
20 discussing.

21 How does all of that play out? That is all
22 post-COL, is that right?

23 MR. HILSMEIER: Right.

24 CHAIRMAN STETKAR: Okay. How does it play
25 out in real-time? Because prior to fuel load, they must

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1 develop this, I will call it, the plant-specific PRA,
2 and addressing all of these key sources of uncertainty
3 from the Certified Design PRA. But that means just it
4 says prior to fuel load.

5 MR. HILSMEIER: Right.

6 CHAIRMAN STETKAR: So, in principle, it
7 could be the day before I start to load fuel. Now I
8 know there has to be some lead time for some audit
9 function, things like that. But, by that time, all of
10 the equipment has been procured and installed in the
11 plant.

12 Suppose the plant-specific PRA identifies
13 equipment that should have been on the D-RAP list from
14 day one or day zero or should have been on the O-RAP
15 list from day zero plus 10 years, but weren't.

16 MR. HILSMEIER: Right, right. That is a
17 very good question.

18 (Laughter.)

19 CHAIRMAN STETKAR: Thank you.

20 MR. HILSMEIER: First, the PRA should be
21 updated to meet the current standards a year, in effect,
22 well before initial fuel load because they need it for
23 Maintenance Rule to help to identify the SSCs and scope
24 of Maintenance Rule.

25 But, also, part of the essential elements

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1 of RAP is updating -- as we talked about before, that
2 RAP list is a live list. And so, part of the essential
3 elements of RAP is ensuring the process continually
4 updates the RAP list.

5 It is to the COL applicant or licensee's
6 advantage to ensure that RAP list is as complete as
7 possible. Because if they identify a new RAP SSC right
8 before initial fuel load, they would need to ensure that
9 that SSC meets the quality controls. If it is
10 safety-related, it needs to meet quality assurance
11 controls, Appendix B, because it is safety-related.

12 CHAIRMAN STETKAR: But it safety, yes.
13 Again, I am not too concerned about the safety-related.
14 I am concerned about the other stuff.

15 MR. HILSMEIER: If it is not
16 safety-related, they would need to ensure that that SSC
17 meets the quality assurance controls in accordance with
18 the provisions of SRP 17.5, Part B.

19 MEMBER SHACK: Let me just come back that.
20 I mean, isn't the D-RAP list frozen with the
21 certification, and anything else would, then, come under
22 the Maintenance Rule?

23 CHAIRMAN STETKAR: But that is
24 operational. I don't mind adding --

25 MEMBER SHACK: That is another question.

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1 Is the O-RAP list a different list or is it just a follow
2 up on the D-RAP, and everything else comes under
3 the -- that was sort of the question I was asking. Now
4 I have the PRA; it seems to me I should be going through
5 this again from the Maintenance Rule, asking very much
6 the same kinds of questions I do when I develop the D-RAP
7 list, except I have now got a more complete, up-to-date
8 PRA with more design details available.

9 So, I mean, I wouldn't call it a D-RAP
10 anymore because it is not D-RAP. That is why I called
11 it "RAP". Now is the O-RAP a living list or is that
12 just part of the Maintenance Rule? I mean, that is how
13 I envisioned it, that once you were done with the D-RAP,
14 you were onto Maintenance Rule, but do you think the
15 O-RAP itself is a living list?

16 MR. HILSMEIER: Yes. When we were
17 developing this Staff Guidance for RAP, we were
18 questioning the same thing. Do we call it D-RAP list,
19 RAP list? And we ended up calling it what John calls
20 it, which is a RAP list.

21 (Laughter.)

22 Because we don't care if it is during design
23 certification or the Maintenance Rule operation phase,
24 the RAP lists or SSCs are subjected to the RAP process.

25 And it is a live list because, like during the design

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1 certification phase, the PRA only covers the design
2 within the design certification envelope.

3 MEMBER SCHULTZ: But describe, Todd, what
4 you mean by a "live list".

5 MR. HILSMEIER: Oh, a live list means, as
6 a PRA changes, it may identify new risk-significant SSCs
7 and those need to be incorporated into a list. And if
8 they are new SSCs incorporated into a list, QA controls,
9 they need to be ensured they meet the QA controls and
10 incorporated into the Maintenance Rule.

11 Now it is expected, and very much expected,
12 that most of the risk-significant SSCs will be
13 identified -- they are currently identified now -- but
14 because of design changes that may occur during the
15 design construction process, cable routing may identify
16 new SSCs, SSCs that were previously not considered
17 risk-significant, and they have become
18 risk-significant, and they are added to the list.

19 MEMBER SCHULTZ: But it --

20 MR. HILSMEIER: Once the -- I'm sorry, go
21 ahead.

22 MEMBER SCHULTZ: Does the live list
23 suggest, then, that not only is the list updated, but
24 also the quantification that results from a change is
25 performed?

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1 MR. HILSMIEIER: You mean the PRA
2 quantification?

3 MEMBER SCHULTZ: Yes.

4 MR. HILSMIEIER: No. Usually, the updated
5 PRA and updated PRA quantification may identify
6 additional or new risk-significant SSCs. But once the
7 PRA for the operational phase is developed, after that,
8 it is unlikely that new risk-significant SSCs will be
9 identified after that initial operation.

10 CHAIRMAN STETKAR: It might. There is a
11 requirement -- and I have forgotten the periodicity;
12 it is either three or four years --

13 MR. HILSMIEIER: Right.

14 CHAIRMAN STETKAR: -- right, that the PRA
15 must be updated for operational experience?

16 MR. HILSMIEIER: Yes. I not saying there
17 won't be any, but it will be minimal -- minimal.

18 CHAIRMAN STETKAR: The thing I was just
19 thinking about is I am back to the main feedwater system,
20 but, in principle -- I have to be careful about wording
21 here -- but, in principle, for example, the heater drain
22 pumps might be procured under some quality requirement.

23 And you might find after operation that, indeed, you
24 have a fairly-significant problem with your heater drain
25 pumps.

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1 The heater drain pumps are certainly not
2 safety-related. They are certainly not modeled in the
3 PRA. However, loss of heater drain flow can lead to
4 loss of feedwater events, which can lead to reactor
5 trips, which can lead to potentially risk-significant
6 transients.

7 So, in principle, in retrospect, you might
8 add the heater drain pumps to your Maintenance Rule
9 requirements and say, "Gee, we ought to enhance the
10 maintenance on our heater drain pumps or" -- you know,
11 maybe not buy new ones, but do something to improve their
12 reliability. And I think every plant goes through that
13 process. You know, they look at operational
14 experience.

15 On the other hand, if I knew about that
16 beforehand, maybe I would have put in a better design
17 specification for the heater drain pumps or a better
18 quality requirement for my initial purchase, so I didn't
19 have to go deal with this issue.

20 And that is a little bit of what I am trying
21 to probe in terms of this transition.

22 MR. HILSMEIER: Right. I don't quite
23 understand your question.

24 (Laughter.)

25 CHAIRMAN STETKAR: The question is

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1 Luminant is going to go out with a bid spec, or MNES,
2 or somebody is going to go out with a bid spec and say,
3 "We need a couple of, two or three" -- I don't know how
4 many heater drain pumps you have -- "and heater drain
5 pumps that are of a certain size and a certain quality,
6 and they deliver a certain amount of flow. You don't
7 necessarily need any reliability of them because they
8 are not important. They are only heater drain pumps,
9 for crying out loud.

10 So, that bid spec for the procurement of
11 those heater drain pumps will have that information.

12 And somebody will design and construct and sell them
13 some heater drain pumps.

14 MR. HILSMEIER: Right.

15 CHAIRMAN STETKAR: If I later determined
16 that those heater drain pumps, because, indeed, there
17 is some risk-significance to loss of feedwater flow,
18 which could be caused by loss of heater drain flow, if
19 those heater drain pumps might actually be
20 risk-importance, Fussell-Vesely importance .005 or Risk
21 Achievement Worth 2, then perhaps that bid spec for the
22 procurement of those heater drain pumps would have been
23 written differently --

24 MR. HILSMEIER: Correct.

25 CHAIRMAN STETKAR: -- either the quality

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1 of construction of the pump itself or some reliability
2 assurance requirements from the vendor of the pump.
3 And I don't see that happening.

4 I understand, once they are in the plant,
5 if my operational experience says, "Gee, I have a problem
6 with them," and it is leading to loss of feedwater
7 events, they may, then, evolve into treatment under the
8 Maintenance Rule.

9 MR. HILSMEIER: Right.

10 CHAIRMAN STETKAR: But some of the
11 stuff -- and I think Bill was approaching it from this
12 same perspective -- there is a gap.

13 MR. HILSMEIER: Those components would be
14 included in the Maintenance Rule, given specific
15 reliability, availability, performance criteria.

16 CHAIRMAN STETKAR: Right.

17 MR. HILSMEIER: Now, if they are not
18 meeting that criteria, it would enter a corrective
19 action process to resolve the issue that is causing them
20 to be unreliable or not meeting the availability
21 performance criteria. And I don't know the specifics
22 of the cause of the failures, but if they are not able
23 to correct the failure through the corrective action
24 program, according to the Maintenance Rule, they would
25 need to continually apply the corrective action program

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1 until they can meet the performance criteria.

2 CHAIRMAN STETKAR: Right. In principle,
3 they might have to go out and buy new pumps --

4 MR. HILSMEIERS: Right.

5 CHAIRMAN STETKAR: -- or something like
6 that. I understand that, how that process works,
7 essentially, after the fact, after you have the
8 equipment installed in your plant and you now have to
9 operate and maintain it.

10 MR. HILSMEIERS: Regarding your question
11 about like the feedwater system, it could incorporate
12 the feedwater systems in RAP, and that means all the
13 SSCs of a feedwater system, including the drain valves
14 are in RAP. There may be advantages to the applicant
15 to identify specifically what components are
16 risk-significant, so, then, they don't have to apply
17 the drain valves. And because it is a live list and
18 it could be continually updated, that process is
19 available for them to do that.

20 CHAIRMAN STETKAR: But that is okay in
21 terms of winnowing down a subset of this nebulous thing
22 that is called main feedwater.

23 MR. HILSMEIERS: Right.

24 CHAIRMAN STETKAR: It doesn't necessarily
25 add things to the list that, again, aren't on the list

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1 right now.

2 MR. HILSMEIER: They add new SSCs to a list,
3 even if it is during the operation phase.

4 CHAIRMAN STETKAR: But operations, I am not
5 interested in the operations right now, and I can't be
6 interested in design certification because that is cast
7 in stone. I am interested in that middle ground,
8 though.

9 When they go out with a bid spec for a pump
10 or a valve, how will that be treated, and how do they
11 determine how it will be treated?

12 MEMBER SCHULTZ: The new opportunity here
13 is in procurement, construction, installation.

14 CHAIRMAN STETKAR: That's right. That's
15 right.

16 MR. HILSMEIER: Right.

17 CHAIRMAN STETKAR: Because once it is
18 installed, the operational experience will tell them
19 whether it is meeting adequate reliability for the
20 purpose.

21 MEMBER SCHULTZ: That's right. But the
22 improvement opportunity that we are trying to achieve
23 here is to get a better start for the process --

24 CHAIRMAN STETKAR: Yes. Right.

25 MEMBER SCHULTZ: -- as we set it up to do.

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1 MR. HILSMEIER: And those RAP SSCs would
2 be subjected to the QA controls in SRP 17.5. I am not
3 an expert to talk about those QA controls. The QA folks,
4 who are not here right now, would need to address that.

5 MR. HAMZEHEE: But, Todd, also, John
6 mentioned the Maintenance Rule appropriately controls
7 this, because if it is not design-related, but rather
8 performance-related, then you don't worry about it.
9 If you worry about design of it, now under the
10 Maintenance Rule the focus is on maintenance,
11 preventable functional failure. But if it is outside
12 maintenance, such as design issues, design
13 deficiencies, or human errors, then there is another
14 place in the Maintenance Rule that would highlight
15 those, and then they have to take some appropriate
16 corrective action.

17 So, there is a small chance that you are
18 right; we may miss that opportunity that something could
19 be a design-type issue that has nothing to do with
20 performance. And if those small cases happen, then the
21 Maintenance Rule would identify them --

22 CHAIRMAN STETKAR: Sure.

23 MR. HAMZEHEE: -- and then, the plants have
24 to either replace the component or correct the
25 deficiency.

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1 CHAIRMAN STETKAR: Okay.

2 MR. HILSMEIERS: Yes, thank you, Hossein.
3 That is an excellent point.

4 MR. HAMZEHEE: Am I right, though, Todd?

5 MR. HILSMEIERS: Yes, yes.

6 CHAIRMAN STETKAR: Yes. Okay. I was just
7 trying to understand -- I understand that part of the
8 process, but I was trying to understand whether there
9 was an opportunity to essentially further refine the
10 understanding of this risk-significance between the
11 list in the certified design, whatever specificity that
12 exists, and the actual loading of fuel and the supporting
13 information that is developed for that loading of fuel,
14 which is what I am calling plant-specific PRA, which
15 may have more detail in it than the design certification
16 PRA.

17 But I hear what you are saying.

18 MR. HAMZEHEE: You know this better than
19 I do, but one of the main reasons that the staff decided
20 to put it in the rule under Part 52, that prior to the
21 fuel load, the COL PRA should be upgraded and updated
22 was because there are still a few areas for which we
23 don't have a standard, such as fire, seismic PRA,
24 shutdown PRA.

25 So, we wanted to make sure that as soon as

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1 those standards are developed, then the COL applicants
2 have to go back and upgrade their PRAs and include those.

3 CHAIRMAN STETKAR: That I understand, but
4 it says before a fuel load; it doesn't say before I go
5 out with my first bid spec for the piece of equipment.

6 MEMBER SHACK: But I think that is the
7 problem.

8 CHAIRMAN STETKAR: That is.

9 MEMBER SHACK: The current requirements
10 don't provide that window that you would like.

11 CHAIRMAN STETKAR: Right.

12 MEMBER SHACK: Now my guess is, if they have
13 it in hand, they would do it. Otherwise, it will be
14 caught, I would guess, in the Maintenance Rule, yes.

15 CHAIRMAN STETKAR: No, it should be; you
16 know, you have to have confidence that it will be caught
17 as part of the Maintenance Rule program because of either
18 additional information from the PRA in a predictive
19 sense or actual operating experience from a plant after
20 it is operated.

21 MR. HAMZEHEE: Also, I think the staff, as
22 what Todd mentioned earlier, that, for instance, since
23 we don't have seismic PRA for many of these things, we
24 do have qualitative Seismic Margins Analysis.

25 CHAIRMAN STETKAR: Uh-hum.

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1 MR. HAMZEHEE: And as Todd mentioned, when
2 they do the risk-significant, they try to be
3 conservative enough so that, once you do have a seismic
4 PRA, the probability of missing something is smaller
5 because we are very conservative. So, that is the
6 approach that the staff has put forward, and I believe
7 it is working well, don't you?

8 MR. HILSMEIERS: And we will see the updated
9 RAP list several times during design construction, when
10 we do the inspection of the D-RAP ITAAC, see the updated
11 RAP list, and, also, when we do the initial inspection
12 of the Maintenance Rule to make sure the Maintenance
13 Rule process has been set up properly. We will see the
14 RAP list and make sure it is incorporated into the
15 Maintenance Rule.

16 CHAIRMAN STETKAR: That is a good point.
17 So, under those inspection activities, you do get
18 several opportunities to think about it anyway.

19 MR. HILSMEIERS: Right.

20 CHAIRMAN STETKAR: Good.

21 Any members have anything else for the
22 staff?

23 (No response.)

24 If not, again, I will thank the staff very
25 much.

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1 And I will ask if there are any members of
2 the public here in the room who have any comments to
3 make about the COL applicants, Chapter 17.

4 (No response.)

5 If not, thanks again. Thanks to you all.

6 We will recess until 12:30.

7 MR. MONARQUE: Oh, John, no open items or
8 no takeaways from the staff on this?

9 CHAIRMAN STETKAR: I didn't hear anything
10 on this one, Steve.

11 MR. MONARQUE: Okay. All right.

12 CHAIRMAN STETKAR: We are recessed until
13 12:30.

14 (Whereupon, the above-entitled matter went
15 off the record at 11:37 a.m. and resumed at 12:34 p.m.)

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

12:34 p.m.

CHAIRMAN STETKAR: We are back in session, and we will hear from Luminant about Chapter 16, "Technical Specifications".

We have already hear, I will refresh everyone's memory -- we had a presentation on the Design Certification Document for Chapter 16 many, many months, probably more than two years ago. So, we are finally getting back around closing the loop on the COLA, Chapter 16.

I guess we still have the bridge line reopened?

MEMBER BROWN: One point on the chapter. That one we did was not -- the SER said it had a ton of open items in it. So, that was not the one we did a year-and-a-half ago.

CHAIRMAN STETKAR: Yes, and that is fine. That is fine.

MEMBER BROWN: We have done it already, and it was not like that when --

CHAIRMAN STETKAR: Well, this phase of our review --

MEMBER BROWN: Yes.

CHAIRMAN STETKAR: -- the SER with open

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1 items, that is true, but --

2 MR. MONARQUE: Correct. And the reason
3 this took a lot longer is because it was tied into our
4 review in Chapter 19.

5 CHAIRMAN STETKAR: Exactly. Exactly.
6 Which is why we are discussing it today.

7 Don, back to you.

8 MR. WOODLAN: All right. Good afternoon.

9 I am still Don Woodlan. That was supposed
10 to be a joke. I told everyone I was going to say that.

11 CHAIRMAN STETKAR: Yes, but you haven't
12 updated your resume. You have like two more hours than
13 the last time you spoke.

14 (Laughter.)

15 MR. WOODLAN: With me today I have Tim
16 Clouser, who is our Acting Luminant Operations Lead here
17 for Comanche Peak Units 3 and 4. He brings a wealth
18 of operating experience with him. And we also have
19 George Wadkins from MNES.

20 And, Mr. Hicks, are you on the phone?

21 MR. HICKS: I am, yes.

22 MR. WOODLAN: All right. We have Mr. Hicks
23 from MNES again on the phone, in case we need him.

24 And with that, I am going to turn it over
25 to Tim to do the presentation.

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1 MR. CLOUSER: Okay. And as Don said, I am
2 Tim Clouser.

3 And, Don, are you going to operate the
4 slides there?

5 We will do our standard agenda,
6 introduction, talk about the open items, confirmatory
7 items, and site-specific issues.

8 So, by way of an introduction, the FSAR
9 uses, incorporated by reference, a methodology with no
10 departures from the US-APWR DCD. All of the COL items
11 are addressed in the FSAR. We have one Safety
12 Evaluation open item and one confirmatory item.
13 License deficiencies are applicable to the tech specs
14 and there are no contentions before the ASLB.

15 So, our one open item is RAI 90. That is
16 request to a provide a full list of site-specific
17 surveillance requirements affected by the Surveillance
18 Frequency Program and the deterministic values for those
19 frequency assignments.

20 So, the resolution for that is that the FSAR
21 will be revised with all the deterministic values that
22 are currently in the DCD tech specs, in addition to the
23 plant-specific items, which is just the ultimate heat
24 site.

25 Next slide.

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1 One confirmatory item, and that is to
2 incorporate the methodology and adequacy requirements
3 in our PRA to support the risk-managed tech specs. The
4 resolution for that is that we will or we do have in
5 tech specs now a requirement in Section 5 to meet the
6 requirements of NEI 06-09 and NEI 04-10, which are the
7 NEI documents that implement a configuration
8 risk-management program and surveillance frequency
9 control program.

10 That's it, Don. The next one.

11 MEMBER SHACK: But you are going to have
12 slightly-amended versions of those, right? That was
13 the discussion in the letter that you had back in June
14 of 2011, and I think that is committed to here. It is
15 sort of vaguely described in some sort of program, but
16 those conditions we saw in the June letter are going
17 to be carried forth into the program?

18 MR. WOODLAN: Yes, and you may remember we
19 did a briefing in the fall on this.

20 MEMBER SHACK: Yes, probably in October.

21 MR. WOODLAN: And you are exactly right,
22 we are adopting the NEI documents, but they had to be
23 updated to cover new plants. They were good property
24 plants, and those are the changes we are making.

25 MEMBER BROWN: Which NEI document are you

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1 referring to, 04-10, for the surveillance?

2 MR. WOODLAN: Yes, right.

3 MEMBER BROWN: Frequency --

4 MR. CLOUSER: 06-09 for the --

5 MEMBER BROWN: 06-09?

6 MR. CLOUSER: -- for the risk-managed
7 aspects.

8 MEMBER BROWN: So, I mean, the version of
9 those that I have is like November of 2006 for 04-10.

10 I think that is the date. I don't remember the date
11 for the other one. I may have them reversed. So, you
12 are all waiting for those NEIs, updating those?

13 MR. WOODLAN: Not yet. I talked to NEI,
14 and it is in the plans to do it. We are the only new
15 plant thus far who is adopting this.

16 MEMBER BROWN: The risk-managed as well as
17 the SFCP?

18 MR. WOODLAN: Yes. So, although they
19 haven't updated it yet, what we did was incorporated
20 it with changes, and our methodology documents all those
21 changes, just like pointed out.

22 MEMBER BROWN: Yes, I don't know whether
23 right now is the right time, but I did have a question.

24 I was reading, it was an old SER from a year-and-a-half
25 ago, or Rev. 8 of the SER with open items. And there

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1 was a statement in there that talked about, page 16-29,
2 that talked about -- and this is staff now
3 saying -- "Continuous self-testing" --

4 CHAIRMAN STETKAR: This is for the design
5 certification SER, though.

6 MEMBER BROWN: Yes, but --

7 CHAIRMAN STETKAR: Okay.

8 MEMBER BROWN: -- it is relative to my
9 comment on the tech specs. I mean, it is the tech specs.

10 CHAIRMAN STETKAR: I just wanted to make
11 sure that, for the record --

12 MEMBER BROWN: Oh, this is not in the code.
13 Yes. No, I am using that to ask about a COLA, I think.

14 CHAIRMAN STETKAR: Okay.

15 MEMBER BROWN: These are mixed and matched.
16 This seems to be where it is going to be executed.

17 It said, "Continuous self-testing and
18 online diagnostic monitoring capabilities will be
19 evaluated in Chapter 7 of this report to determine the
20 extent to which these features" -- continuous
21 self-testing and diagnostic monitoring -- "may be
22 credited towards completion times and surveillance
23 testing."

24 And I guess the PRA is supposed to develop
25 some part of that as the risk-informed application of

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1 some of the surveillance comes out of the PRA, I guess.

2 I mean, I am not a PRA person.

3 But it goes on to say that, "The
4 Probabilistic Risk Analysis will provide detailed
5 explanations and fault trees" for the next revisions
6 and to support the PSMS Reliability Analyses and the
7 surveillance stuff.

8 And so, I just wondered what that was. So,
9 I went off and looked at the tech specs in Chapter 16.

10 And I will just pick an example, and I happen to have
11 it. Ah, where did it go? Here it is.

12 In Section 3.3.1, where it talks about
13 reactor trip systems and other instrumentation-type
14 stuff, for calibration checks and other type things,
15 they refer to like 24-months periodicity or intervals
16 or as defined by the SFCP, the Surveillance Frequency
17 Control Program. And that is developed via this
18 risk- and PRA-type-based stuff, based on NEI 04-10 and
19 06-10, whatever.

20 And I guess what I wanted to know was 24
21 months for, say, a calibration check? Is the PRA and
22 the SFCP now going to come through and say, "Well, we
23 don't have to do that for five years."? I am trying
24 to figure out what is the relation between adjusting
25 these surveillance frequencies when, yes, I can't wrap

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1 my head around testing and confirming that a sensor
2 actually provides calibrated signals on something more
3 than a year or two basis. I can understand a refueling
4 interval, just because the plants are operating
5 continuously, but extending it to two or three
6 refuelings --

7 MR. WOODLAN: Well, let me try, first, to
8 give you the licensing understanding, and then, Tim
9 maybe can fill in.

10 The Surveillance Frequency Control Program
11 is primarily a performance-based program. It looks at
12 your success and what kind of challenges you have had
13 on an individual component, and you adjust based on that
14 for the PRA.

15 MEMBER BROWN: Okay. Now let me go
16 backwards.

17 MR. WOODLAN: Okay.

18 MEMBER BROWN: Okay? Twenty-four months,
19 you are saying, say we do three 24-month ones, and you
20 say, "Gee, we haven't failed any of those. Therefore,
21 we will go two refueling outages." That is what I would
22 envision you telling me. We would extend the
23 periodicity based on the performance. Is that --

24 MR. CLOUSER: I guess it is possible, but
25 it is highly unlikely because the two or three successor

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1 satisfactorily surveillances, depending on what the
2 length of time is, it is just the entering proof you
3 have got to go through to start the process to look at
4 it. Then, you have got to look at the PRA, make sure
5 that the core damage frequency doesn't go up and the
6 larger early-release frequency. And then, you have to
7 look at whether, if that equipment does fail, how that
8 is going to affect the PRA. And then, there is just
9 a whole long laundry list of things that you have to
10 go through, looking at all those surveillances. And
11 then, it has got to go through an independent or an
12 integrated decisionmaking panel, in other words, an
13 Expert Panel, to make sure that it all makes sense after
14 you meet all those other hoops.

15 So, just satisfactorily completing a couple
16 of those surveillances doesn't get you there. It just
17 barely gets you started.

18 I don't know if that --

19 MEMBER BROWN: All I am trying to do is get
20 a feel for what you are -- I am just not familiar with
21 the civilian stuff as much as I am the program that I
22 came out of after many, many decades. Because there
23 is a differentiation between the availability to do
24 certain types of checks on ships than there are in the
25 civilian plants, just based on mode of operation.

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1 Some things, I mean, I could totally
2 understand it because we did it. I mean, channel
3 checks, for instance, they refer to as 12 hours, every
4 12 hours. I mean, if you have got channels that don't
5 meet their channel check three or five times, you have
6 got a bigger problem than what you thought, if you are
7 doing testing on a 12-hour basis.

8 I mean, we used to do weekly checks of that
9 type, and we actually tried, we actually did evaluate
10 our weekly checks and determine, geez, we can do them
11 monthly because of the multiplicity or the redundancy
12 that you have, that we could do that and do that
13 fairly -- so I don't have a problem with it. It is just
14 when I get out to -- and the digital stuff is, by and
15 large, better than the analog stuff past this detector,
16 you know, the amplifiers and everything else. I was
17 just trying to get a feel for what that meant relative
18 to the critical calibration-type functions, which are
19 time-intensive and are very much a function of when the
20 plant is shut down as opposed to those that you can do
21 in place with your test signals or other type stuff.

22 So, I am just saying there is a lot of other
23 hoops to go through. Has this been implemented in any
24 operating plants?

25 MR. WOODLAN: Yes. How many? Two?

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1 Three?

2 MR. CLOUSER: Many.

3 MR. WOODLAN: Many, and there's a lot more
4 applying it. Most of the industry is going this way.

5 CHAIRMAN STETKAR: When you say "many,"
6 there are a few, I think, on surveillance frequencies.
7 There is a lot more on misinformed outage times.

8 Come up to the microphone.

9 MR. TJADER: Bob Tjader, NRO, Tech Specs.

10 It is actually the other way around.

11 MR. WOODLAN: I thought that the
12 frequencies were --

13 MR. TJADER: The Surveillance Frequency
14 Control Program is an offline application of PRA and
15 risk assessments. And Doc is absolutely right, as is
16 Mr. Tim Clouser. To revise surveillance frequencies
17 requires going through an accuracy form of the back of
18 04-10 that has to be filled out and complied with.

19 And there are -- I don't know the number;
20 NRO Tech Specs would know the number -- but I think
21 probably over 50 percent of the plants have applied for
22 a Surveillance Frequency Control Program. I know
23 probably the vast majority are going to do that.

24 Limerick was the first. Diablo Canyon has
25 it. I would say probably a quarter of the plants

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1 probably have it right now.

2 CHAIRMAN STETKAR: Is it? Okay. Thanks.

3 MEMBER BROWN: Excuse me. Go ahead. I
4 didn't mean to interrupt you.

5 MR. TJADER: And there is only one plant
6 that has risk-informed completion times at the moment,
7 and that is South Texas.

8 MEMBER BROWN: What do you mean by the
9 completion times? Do you mean how long --

10 MR. TJADER: Allowed outage times.

11 MEMBER BROWN: Allowed outages?

12 MR. TJADER: Yes.

13 MR. WOODLAN: LCOs.

14 MEMBER BROWN: Oh, outage, a system or a
15 set of equipment or something? Okay.

16 MR. TJADER: Yes.

17 CHAIRMAN STETKAR: I had it reversed
18 somehow. I had heard differences, but I am wrong.

19 MEMBER BROWN: When you say "outage," do
20 you mean like the 72 hours with the channels out of
21 service, something like that, and trying to extend those
22 periods?

23 MR. TJADER: If the condition statement
24 allows you to enter -- in the case of Comanche Peak,
25 it would be Tech Spec 5518 -- if that specific required

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1 action allows you to enter that, then you can do the
2 online risk assessment and determine what an appropriate
3 completion time would be.

4 MEMBER BROWN: You do that in real-time?

5 So, if the outage occurs, then you start
6 applying -- that is what I mean by real-time, that you
7 have a problem, and you start doing this risk assessment
8 to see if you have to comply with the 72 or you can stretch
9 it to 128, or whatever, some other number.

10 MR. TJADER: You cannot stretch it beyond
11 30 days. That is the backstop.

12 MEMBER BROWN: Well, 3 days to 30 days is
13 a fairly --

14 MR. TJADER: I mean, well --

15 MEMBER BROWN: No, that is okay. I
16 understand that. I wasn't thinking of it in terms of
17 outage times. I was really look at it in terms of what
18 I was looking for was the calibration, both the
19 analog/digital-style calibrations and basic
20 instrumentation channels, as well as normal channel
21 check.

22 One I could see moving based on a
23 performance-based response, and the other, go after two
24 years and, then, stretch it out to four years to check
25 that your detectors are actually doing what they are

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1 supposed to be doing. It seems to be --

2 DR. TANAKA: I think they would have to
3 really justify extending it based on only two or three --

4 MEMBER BROWN: Do they have to get NRC
5 approval, concurrence to do that?

6 MR. TJADER: No.

7 MEMBER BROWN: They can do it within their
8 own --

9 MR. TJADER: We can audit it.

10 MEMBER BROWN: Okay.

11 MR. TJADER: Our inspectors can review it
12 and audit it.

13 MEMBER BROWN: But they can make that
14 decision on their own, to extend those surveillance
15 periods, based on this program?

16 MR. TJADER: Right.

17 MEMBER BROWN: Has NRC formally endorsed
18 that surveillance program?

19 MR. TJADER: Absolutely.

20 MEMBER BROWN: Okay. I had thought I had
21 read something that it had. I just thought I would --

22 MR. TJADER: There are Safety Evaluations
23 for 04-10 and 06-09, which I think you referred to as
24 2006 or something.

25 MEMBER BROWN: The 04-10 I think was 2006.

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1 MR. TJADER: Yes, right.

2 And then, the NRC, NRR has endorsed it
3 through the granting of license amendments that adopt
4 these.

5 MEMBER BROWN: Okay. So, in order for a
6 licensee to do it, you have to give agreement to proceed
7 to do it, right? It is a license amendment request to
8 get that, so they can actually implement that program?

9 Okay. Thank you.

10 MR. TJADER: Yes, I don't have any more on
11 that.

12 MR. CLOUSER: Okay. Moving on to
13 site-specific aspects -- go back one; you moved on a
14 little too quickly -- US-APWR tech specs bases are
15 adopted by Comanche Peak Nuclear Power, Units 3 and 4,
16 COLA, Part 4, and the site-specific information is
17 provided in previously-bracketed areas.

18 Comanche Peak Nuclear Power Plant, Units
19 3 and 4, have adopted risk-managed tech specs and a
20 Surveillance Frequency Control Program developed under
21 the Initiatives 4B and 5B, as we just discussed.

22 Luminant will be establishing a
23 Configuration Risk-Management Program and the a
24 Surveillance Frequency Control Program to be completed,
25 reviewed, and approved by the NRC prior to fuel load,

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1 and that is out of Tech Spec 5518 and 19 which Bob just
2 mentioned.

3 And Luminant is following the DCD tech spec
4 changes that are still under discussion to see how it
5 will affect the COLA.

6 CHAIRMAN STETKAR: Just so we are clear on
7 that second bullet on that slide, it says, "CPNPP adopt
8 risk-managed tech specs and a Surveillance Frequency
9 Control Program". You are not proposing to change any
10 LCO times or surveillance frequencies from the design
11 certification tech specs prior to issuance of the COL,
12 are you?

13 MR. CLOUSER: That is correct; we are not.

14 CHAIRMAN STETKAR: You are not? You will
15 adopt verbatim, that last bullet discussion verbatim,
16 the design certification tech spec. So, that second
17 bullet actually is post-COL issuance, with the exception
18 of the structure of the tech spec that says either do
19 this --

20 MR. CLOUSER: Right.

21 CHAIRMAN STETKAR: -- or option whatever?

22 MR. CLOUSER: But it would be a section of
23 the client-specific, which is the ultimate heat sink.

24 CHAIRMAN STETKAR: Yes. Okay. Thank
25 you.

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1 MR. CLOUSER: Okay.

2 COLA, Part 4, Section A, justifies to the
3 plant-specific information that has been replaced in
4 the bracketed areas of the DCD, and there are 25 of those
5 specific items. And Section B adopts the entire
6 plant-specific or shows the entire plant-specific tech
7 spec.

8 And that would be it.

9 MEMBER BROWN: I do have one more question.

10 MR. CLOUSER: Okay.

11 MEMBER BROWN: This is just an information
12 thing, I think. I saw the test for channel checks.
13 I saw the ones for calibration checks. There is another
14 one called channel operational tests, which are
15 different than calibration checks where you are dealing
16 with the sensor directly or just the channel checks which
17 kind of sees -- it is a qualitative test that just sees
18 that the signal propagates from input to output.

19 The channel operational test put in a
20 simulated signal to represent, so you could kind of test
21 the memory of the amplifiers, whatever else. That is
22 also 24 months, and I guess that must be consistent with
23 what you do on your Units 1 and 2. Otherwise, you
24 probably wouldn't have it in here, I guess.

25 But you don't have to shut the plant down

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1 to do that. And if you have got multiple trains for
2 reactor trip and SFAS-type systems, it just seemed like
3 that was a pretty long time to do what I would call a
4 simulated input, either by whether it is computer-done
5 or whether it is done by manual switches. And it can
6 be done either manually or automatically for the other
7 words in here somewhere.

8 That 24 months for just doing a check with,
9 say, a resistor, you know, for a temperature channel
10 or an LPT, or something like that, for a pressure channel
11 seems like a fairly long time.

12 MR. CLOUSER: And I do understand your
13 question and concerns. I am not sure I can address it.

14 MEMBER BROWN: I am just looking, is that
15 consistent with your all's other plants or for other
16 commercial plants, that that is, quote, "simulated input
17 to a channel" in redundant systems, and the protection
18 of the trip system and the SFAS system are two years?

19 That doesn't seem to have to wait for an outage to do
20 that.

21 MR. CLOUSER: I have been away from our Unit
22 1 and 2 tech specs for six years. So, I can't tell you
23 for sure what it is currently.

24 MEMBER BROWN: Can the staff answer that?

25 MR. MONARQUE: What was your question

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1 again?

2 (Laughter.)

3 MEMBER BROWN: You were an operator, John.
4 I thought you would know this.

5 CHAIRMAN STETKAR: You said "the staff,"
6 and I was an operator before most of the people in this
7 room were born.

8 (Laughter.)

9 MEMBER BROWN: Channel operational tests
10 called COTs are specified in the tech spec -- this is
11 in Chapter 16, the DCD -- to be performed every 24 months
12 or in accordance with the SFCP. Okay? That is the same
13 for all of them. But the 24 months, the channel
14 operational test is where you actually insert a test
15 device at the input as opposed to, even on the
16 microprocessor-based systems where you introduce a
17 digital signal upstream of the analog-to-digital
18 converter, not downstream of the analog-to-digital
19 converter. And you check that you get the proper
20 calibrated signal via a number of resistance inputs or
21 LBDT inputs, or whatever they are.

22 Channel checks are just qualitative. You
23 say do this, and does it trip? And then, the calibration
24 check is where you actually go check the detectors, the
25 sensors themselves.

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1 Twenty-four months on the equipment I am
2 familiar with, we had the capability while you were in
3 operation to test each thing with a simulated signal
4 that would pass through that particular channel and tell
5 you, did you generate the proper trip, was it calibrated,
6 et cetera. You didn't have the detector in it, but it
7 did go into the analog-to-digital converter to make sure
8 that talked, the digital part, the digital stuff, or
9 in the old systems it was in the bridges that took the
10 output to the LBDTs and the resistance places, and check
11 that those were still operating satisfactorily.

12 We did that much more frequently, okay?
13 Like weekly initially, and then, we finally went to
14 monthly or something like that. But 24 months just
15 seemed to be a long stretch for checking the
16 analog-to-digital conversion part of these things, when
17 it can be done in-service when you have multiple trains.

18 So, I don't know what they do today in the
19 civilian plant. My question is, if that 24 months is
20 consistent with what is done in the commercial plants
21 today, that you all have accepted that? Then, I don't
22 have -- well, I couldn't complain -- I don't have much
23 basis for saying you ought to change. Okay?

24 But it popped up here, and I don't remember
25 seeing that anyplace else. So, that is why I asked.

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1 MR. MONARQUE: Okay. Let me --

2 MEMBER BROWN: You don't have to answer it
3 right now. You can get back to me. You don't have to
4 answer that right now. If you want to get back to me
5 later sometime --

6 MR. MONARQUE: Okay.

7 MEMBER BROWN: -- that is okay. So, we can
8 go on.

9 MR. MONARQUE: Okay. We will take that
10 away as an action item, and we will get back to you on
11 that.

12 MEMBER BROWN: Okay. Thank you.

13 CHAIRMAN STETKAR: Thanks, Steve.

14 MR. MONARQUE: Thank you.

15 MEMBER BROWN: I'm done now -- maybe.

16 CHAIRMAN STETKAR: But are you finished?

17 MEMBER BROWN: I am really finished.

18 (Laughter.)

19 CHAIRMAN STETKAR: Any other members have
20 questions for Luminant?

21 (No response.)

22 If not, again, this one was really painless.

23 (Laughter.)

24 We will have the staff come up and discuss
25 Chapter 16.

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1 And I guess, Girija, we can close the bridge
2 line, if you want. It just keeps the pops and crackles
3 down.

4 Mr. Hicks, on the other end of the bridge
5 line, we are going to close it from this end. Even though
6 you have been really good about muting your end, we still
7 get a lot of noise. So, if for some reason a question
8 comes up where we need your help, we will reopen it,
9 but it just helps the general noise level down here on
10 this end. Okay?

11 Thank you.

12 MR. ROY: Okay. My name is Tarun Roy. I
13 am the NRO Project Manager. I am responsible for
14 coordinating staff review of the Chapter 16 COLA
15 application.

16 The NRC technical staff involved in the
17 review is from the Balance of Plant and Technical
18 Specifications Branch, Mr. Bob Tjader.

19 During this meeting, the staff plans to make
20 a presentation on Chapter 16, Safety Evaluation Report
21 with Open Items. We have 20 questions we asked the
22 applicant requesting additional information. Out of
23 20 questions, there is one open item unidentified in
24 the SER. The staff will discuss the open item in detail.

25 Now I turn over the presentation to Mr. Bob

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1 Tjader.

2 MR. TJADER: Thanks, Tarun.

3 This is just for confusion's sake, this
4 Theodore Tjader.

5 (Laughter.)

6 My middle name is Robert. So, I go by Bob.

7 As Don presented, there is open item and
8 one confirmatory item. We will present the summary of
9 those.

10 Next slide, please. That's it, yes.

11 As previously presented, the design
12 certification specs, the US-APWR tech specs, provide
13 the option for adopting risk-management tech specs,
14 otherwise known as risk-informed completion times and,
15 also, adopting Surveillance Frequency Control Program
16 options based on NEI 06-09 and 04-10.

17 Comanche Peak has opted to adopt these risk
18 initiatives, these I guess state-of-the-art
19 applications of PRA, use of risk information. As
20 previously stated, the risk-management tech spec and
21 Surveillance Frequency Control programs, they require
22 programs in the tech spec admin control section, Section
23 5 of the specs, which incorporate, in essence, NEI 04-10
24 and 06-09 into the methodology and the requirements in
25 those documents, incorporate them into the specs. And

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1 Comanche Peak has done that.

2 Next slide, please.

3 Since these two applications, these two
4 programs, apply PRA and risk information based on PRA
5 information, the PRAs have to have a capability and a
6 quality, so that they can be applied for these
7 applications. And since the PRA itself will not be
8 ready until the as-built, as-to-be-operated plant is
9 available about a year prior to fuel loading, and it
10 is not available at the time of COL issuance, then a
11 program is required. The tech specs are required to
12 be complete at the time of the issuance of the license,
13 in accordance with ISG-08.

14 We provide three options to comply with and
15 meet these requirements, and Option 3 methodology is
16 the option that is being applied for ensuring that the
17 PRA is adequate to support these programs.

18 The staff has reviewed Comanche Peak's tech
19 spec methodologies for completing a PRA. We have, in
20 essence, approved it in the Safety Evaluation for
21 Chapter 9, and we have, through an iterative process
22 with Luminant, have determined that it is adequate for
23 applying to these programs.

24 The methodology for ensuring the PRA is
25 adequate, not only does it ensure that the PRA is

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1 adequate, but, as also previously applied, it also
2 updated NEI 06-09 and 04-10 to a small degree to ensure
3 that they apply to the new plants. And these also are
4 referenced in the admin control section in the same
5 paragraphs of 5.5.18 and 5.5.19.

6 Next slide.

7 CHAIRMAN STETKAR: Bob, before you get to
8 this open item --

9 MR. TJADER: Sure.

10 CHAIRMAN STETKAR: -- I read all of the
11 words about approving methodologies and approving NEI
12 guidance and all of the things that you just discussed.

13 How does the staff assure themselves, and when is that
14 assurance developed, that, indeed, the PRA that is used
15 to support those risk-managed tech specs is of
16 sufficient quality for those applications?

17 Because it is clear, reading the SER for
18 Chapter 19 of the design certification, that the current
19 PRA is not adequate. So, things have to be done, things
20 that are perhaps more fundamental than simply saying
21 what is the installed -- you know, do I have a
22 motor-operated valve here, for example.

23 Do you rely completely on the peer-review
24 process that is done under the NEI guidance to give you
25 that assurance that the PRA is complete and of adequate

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1 technical detail?

2 MR. TJADER: Well, we rely on the
3 peer-review guidance. We rely on Reg. Guide 1.200.
4 We rely on the requirements stipulated, that it has to
5 be, you know, Capability Category 2, PRA, that sort of
6 thing. In addition, the methodology has some -- the
7 licensee has to address certain uncertainty aspects of
8 the PRA.

9 But, to a large degree, just as Reg. Guide
10 1.200 is allowed to be applied by individual licensees
11 on operating plants without prior NRC oversight, so,
12 too, are we relying on this peer-review process in Reg.
13 Guide 1.200 to be applied by the licensee. Now that
14 is not to say that separately the PRA does have, I
15 believe, ITAACs associated with it, not associated
16 directly with the tech specs, but they do, to ensure
17 that they are appropriate.

18 And just because there is not stipulated
19 that inspection or an oversight review by the resident
20 inspectors and things like that -- I am sure that that
21 will occur. And we will ensure that it is adequate.

22 MR. MONARQUE: Oh, John? John?

23 CHAIRMAN STETKAR: Yes?

24 MR. MONARQUE: We do have Lynn Mrowca here
25 to give supplemental information --

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1 CHAIRMAN STETKAR: Good.

2 MR. MONARQUE: -- to answer your question.

3 CHAIRMAN STETKAR: Hi there.

4 MS. MROWCA: Hi. This is Lynn Mrowca.

5 One more thing to add to what Bob said is
6 that we have precedent for inspecting the implementation
7 of risk-managed tech specs. So, we fully assume that
8 that will be done.

9 CHAIRMAN STETKAR: Okay. I will bring up
10 more when we get to the Chapter 19. I am troubled about
11 this process, quite honestly, because I read words, and
12 I know the SER says otherwise, that, indeed, the thing
13 that I can look at today, Rev. 3 of the PRA, has been
14 subject to a peer review according to the guidance in
15 Reg. Guide 1.200 and satisfies all of the ASME/ANS
16 standards for quality of the PRA. And it is my opinion
17 that it doesn't.

18 And I will bring up very specific examples.

19 I know the staff has taken issue with those statements.

20 But my concern is that, if we keep relying as an agency
21 on peer reviews of things that have received tacit
22 approval of the NRC staff -- the NRC staff has tacitly
23 approved the design certification PRA, except for these
24 key issues of uncertainty, or something like that -- we
25 are walking ourselves down a slippery slope where nobody

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1 has really taking a holistic view at that PRA to say,
2 is it really what I would call a risk assessment rather
3 than a political document, quite honestly?

4 And I would hope that the staff and those
5 inspections, if that is the only vehicle that you have
6 for the actual risk-informed technical specifications,
7 performs a rather detailed audit of the PRA and a rather
8 detailed review of that peer-review document. Because
9 peer reviews are peer reviews. They are done by human
10 beings over a limited amount of time, according to
11 guidance that is written on pieces of paper.

12 MS. MROWCA: We fully agree, and that would
13 be our plan, to do a detailed review at that point.
14 And implementation can occur anytime, you know,
15 post-fuel-load. So, I would expect that we would do
16 something very quickly after that.

17 CHAIRMAN STETKAR: Okay.

18 MR. TJADER: It is my understanding,
19 though, that the peer reviews are rather rigorous these
20 days, that the licensees have experience of doing them
21 with respect to PRAs, and they are pretty self-critical.

22 CHAIRMAN STETKAR: You know, I haven't been
23 involved in any. So, I can't comment on that. My
24 problem in seeing reviews that have been done in the
25 past is that people tend to review what is there and

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1 accept previous audits, inspections, whatever, as
2 assurance that what isn't there ought not to be there,
3 if you will. And those omissions are where people get
4 in trouble.

5 MEMBER SHACK: Of course, that is a larger
6 question than just this.

7 CHAIRMAN STETKAR: That is a much larger
8 question. It is why I am going to talk about it a little
9 bit more in the context of the design certification PRA.

10 MR. TJADER: Well, we agree that it is an
11 important question, particularly for applying
12 risk-informed completion times.

13 CHAIRMAN STETKAR: And in particular, on
14 this one, I mean, I dug into this PRA a little bit more
15 detailed than I would normally do because of its
16 projected use going forward, recognizing that we, as
17 the ACRS, won't have this opportunity again. At the
18 COL issuance, our involvement ends. So, any of our
19 concerns regarding potential pitfalls in using this
20 particular model going forward, we basically have to
21 get out on the table either today or when we revisit
22 these chapters in the final SER.

23 MS. MROWCA: There is different criteria
24 for a design certification PRA than there would be for
25 one that implements a risk-informed application, and

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1 we fully understand that, that there will be quite a
2 few changes between the design certification PRA and
3 the one that is used to implement risk-managed tech
4 specs.

5 CHAIRMAN STETKAR: As long as everyone
6 understands that, as long as the applicant is fully
7 cognizant of the fact that they can't take this
8 particular risk assessment, add in a plant-specific
9 switchyard arrangement, and plant-specific ultimate
10 heats in cooling towers, and say the NRC staff has said
11 this one is okay. MHI has said that it has been
12 peer-reviewed and meets all of the ASME/ANS standards.
13 That is in writing. And therefore, we can use it.

14 MS. MROWCA: That is why we have been very
15 careful about documenting assumptions, uncertainties,
16 and trying to make sure that our COL action items or
17 older items include those details of the PRA that we
18 have seen that need to be upgrade/updated prior to use
19 of it for risk-managed tech specs.

20 CHAIRMAN STETKAR: Okay. Thank you.

21 MEMBER SHACK: It is a little strange that
22 the one example we have of risk-managed tech specs is
23 South Texas, which is sort of reputed to have a very
24 high-quality PRA, and now we are suddenly going to leap
25 to a plant with no operating experience, you know, and

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1 it is just a little different.

2 (Laughter.)

3 CHAIRMAN STETKAR: I understand.

4 MEMBER SCHULTZ: It presents different
5 challenges.

6 MEMBER SHACK: It presents different
7 challenges.

8 CHAIRMAN STETKAR: Well, it presents a lot
9 of challenges, in my mind. I understand the design
10 certification process and what is expected of a PRA to
11 satisfy the intent of that process. I understand. I
12 don't have to agree with it, but I understand it.

13 The challenges are for Luminant going
14 forward and that poor peer-review team who must take
15 something with a history to it now -- it is not a new
16 PRA that is presented to you, and you are assessing the
17 quality of it -- it is something that now has a history,
18 and very, very rigorously critique that risk-assessment
19 model for its quality, detail, and all that kind of stuff
20 to support those applications. That is a real challenge
21 from a real practical review perspective and assurance
22 perspective.

23 CHAIRMAN STETKAR: Yes, you have listed
24 three very important components of the task, and it
25 hasn't been done before.

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1 CHAIRMAN STETKAR: That's right.

2 MR. TJADER: With regard to its application
3 to the risk-informed completion times, I personally
4 don't feel that we are going that far out on a limb or
5 taking that much of a risk and applying it to it, for
6 a number of reasons.

7 No. 1, we have the backstop where you can't
8 extend the completion time beyond that. Generally, for
9 Comanche Peak, in particular, they are applying it to
10 a very limited set of completion times, and you are not
11 allowed to apply it to loss of function. You basically
12 apply it to a loss of a single train for the most part,
13 application.

14 And in addition to that, because Comanche
15 Peak is a four-train system, and we are applying it to
16 one or two trains out, for the most part I think that,
17 in fact, whatever PRA you come up with, assuming that
18 you come up with a good one, but, I mean, assuming there
19 is a lot of uncertainty in it, and given that initially,
20 I still think that it is not highly inappropriate to
21 apply it because you have a four-train plant. You are
22 limiting its application. And because it is a
23 four-train plant, and you apply the metrics that 06-09
24 allows you to apply, in many cases, if not most of them,
25 you would probably run into the backstop, the 30 days,

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1 because it is relatively risk-insignificant.

2 So, it is not like we are allowing them to
3 operate in an unsafe manner. We are not. In fact, if
4 anything, I look at these applications as actually
5 enhancing safety. In fact, that is what they should
6 be doing and are doing, is enhancing safety, because
7 you are letting them apply an appropriate completion
8 time for restoring equipment to operable status prior
9 to taking subsequent actions, such as shutting down the
10 plant.

11 CHAIRMAN STETKAR: One of the things we
12 found on South Texas -- and I happened to have been
13 involved in the first applications of that PRA -- is
14 that they discovered that some of their completion times
15 they needed to rein-in a little bit. They needed, in
16 fact, to tighten them up compared to what they had in
17 the generic tech specs. It was kind of a surprise to
18 them, and they did that.

19 And --

20 MR. TJADER: Let me -- go ahead.

21 CHAIRMAN STETKAR: Let me finish.

22 Things that bother me are that, for example,
23 the current completion times that are in the existing
24 design certification tech specs aren't modeled in the
25 PRA. The capability to have two pieces of equipment

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1 out in the same system simultaneously, as allowed in
2 the current PRA for 72 hours for a large number of
3 systems, is not only not modeled, it is logically
4 excluded. There is logic in the PRA model that does
5 not permit that configuration. It has zero likelihood.

6 The logic explicitly excludes it.

7 So, the current PRA doesn't even model the
8 current tech specs, period. So, I don't know whether
9 the current PRA -- you know, certainly you can't use
10 the current PRA to justify extending the tech spec times
11 because it doesn't model what is in there now.

12 Those are some of my concerns. If, indeed,
13 I looked at today's PRA and said, oh, yes, they
14 allowed -- there is some uncertainty; I don't know
15 exactly how long within this indeterminate time that
16 I can have a single train out, how long it might be out.

17 I have experience from European plants that might a
18 week to a couple of weeks per refueling outage because
19 it is planned maintenance now, not emergency
20 maintenance. And I don't have the likelihood that two
21 pieces of equipment will be out at the same time. That
22 tends to be combinations of plant and emergent
23 maintenance.

24 I don't know. There is some uncertainty
25 about that. But the models don't even include that.

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1 I can't even test that in the current model.

2 The staff, during their review of the PRA,
3 asked for some sensitivity studies, and it was
4 identified as a key issue of uncertainty to be resolved
5 later, when the plant-specific PRA is developed for
6 these risk-informed applications.

7 So, the confidence that applying the PRA
8 to most likely support running into backstops, I don't
9 necessarily have that confidence. That might happen;
10 that might not happen.

11 Those are some of the concerns that I have,
12 you know, kind of going forward from what we can look
13 at today to support the design certification and what
14 is available at the time of COL issuance, making that
15 large leap to a real risk assessment to support these
16 risk-informed applications.

17 And we will talk a little bit, I think, more
18 about that when we get to the PRA itself. I mean, that
19 sort of ended my rant for now. But those are some of
20 the concerns at least that I have.

21 MR. TJADER: Well, it could be that the PRA
22 doesn't model one train out, because when you deal with
23 four trains, two are required.

24 CHAIRMAN STETKAR: I will tell you what it
25 does. It models an average unavailability of each

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1 component in the plant based on generic data from
2 NUREG/CR-6928, which is U.S. data with U.S. tech specs
3 and U.S. plant design. That is what it does.

4 And it models that individually for each
5 component in the plant. It does not take an entire train
6 out, as plants in Europe do. So, you will do a planned
7 maintenance on Train A. Simultaneously, every piece
8 of equipment in Train A will be out some number of days.

9 They do that because they can do that, and it allows
10 them to perform maintenance during operation. I mean,
11 it is why you build a four-train plant from an operations
12 perspective.

13 So, the PRA does not have that coordinated
14 train-level maintenance. Every piece of equipment is
15 out independently in the plant, and the logic precludes,
16 through the structure of the fault trees, precludes two
17 pieces of equipment in the same system being out
18 simultaneously. The PRA model will not allow two
19 emergency feedwater pumps to be out simultaneously.
20 Now the tech specs for emergency feedwater will not allow
21 that.

22 For electrical buses, AC and DC, AC buses
23 high-head injection pumps, for cooling-water pumps, for
24 essential service water pumps, all of those things can
25 have two pumps out simultaneously. The PRA model does

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1 not allow that. It precludes it logically. You cannot
2 see a cut set with those two out.

3 So, it does not model the tech specs at all,
4 nor does it model the likely application of the tech
5 specs for this coordinated planned maintenance that a
6 lot of plants do where you have entire train out. You
7 can have Train A HHSI pump out independently or you can
8 have Train A EFW pump out independently or Train A,
9 whatever I said, containment spray pump out, but you
10 can't have them all out at the same time.

11 Again, the staff's review of Chapter 19
12 acknowledged this, and some sensitivity studies were
13 done and say, yes, if we did that, the risk would
14 increase, but, well, that is a key uncertainty issue
15 to be resolved later.

16 My question, when staff comes up for Chapter
17 19, is, why don't we resolve it now? Why don't we really
18 make the design certification PRA model the design and
19 the design certification tech specs? Start from there.

20 MR. TJADER: Well, I think we do have some
21 things we can do.

22 CHAIRMAN STETKAR: Well, yes, we will talk
23 a few more things about it. But this is important, back
24 to the topic at hand, this is important I think for our
25 understanding, at least to know the process that people

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1 are going to apply and sort of the timing considerations
2 when that process will be implied.

3 Now you can go to your open items.

4 MR. TJADER: Okay. Open item. One of the
5 RAIs was requesting, since Comanche Peak was adopting
6 the Surveillance Frequency Control Program for many of
7 the surveillances that are in the tech specs, they have
8 chosen to say, in accordance with the Surveillance
9 Frequency Control Program, in the frequency column "as
10 is appropriate," but we wanted them to state what are
11 the initial frequencies that you are using. And the
12 response to the RAI was that we are using the initial
13 DCD values, except for ultimate heat sink, which is a
14 site-specific system, and we will give you those
15 numbers, which they have done.

16 And then, those numbers will be in the
17 program. So, from a tech spec perspective, when you
18 are up and operating, that is perfectly satisfactory.

19 The numbers are in the program. The program is required
20 by specs. And to revise them, you have to do it in
21 accordance with the specs, in accordance with the
22 referenced 04-10.

23 So, when you are up and running and you have
24 the program in place, you have the frequencies in the
25 program, that is fine. The members of the staff,

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1 however, raised the question, "Well, before the program
2 is actually" -- that is, the actual, not the tech spec
3 program which is there, but the program that it
4 references that is going to incorporate or include these
5 surveillance frequencies, that will not be in place
6 until, again, probably -- well, pure load is when all
7 these programs, however they are processed for creating
8 the programs is, will be in place. This is, until that
9 point in time -- you know, once you are up and running,
10 the frequencies are in the program and are hard and fast.

11 They are as if they are in the column, in the frequency
12 column in the spec. But, until that program is approved
13 and ready for use, there is this period of time between
14 the COL and that program where the question is raised,
15 well, what if they come up with a better frequency for
16 one of the numbers and they want to change it? You know,
17 what is to prevent them from doing that or just changing
18 the number?

19 And so, we requested that they put the
20 initial values of the Surveillance Frequency Control
21 Program in the FSAR, so there is some oversight process
22 to it initially. And they have agreed to do that.

23 So, it just a matter of us -- and actually,
24 all that they need to do, in essence, is reference in
25 Chapter 16 of the FSAR, reference the DCD values. They

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1 don't even have to have the list except for the ultimate
2 heat sink, which they will put in there. They have
3 agreed to do that.

4 So, the reason it is open is that we just
5 need to see their proposal for where they are putting
6 it, i.e., Chapter 16 of the FSAR, and what they are
7 putting there. And once we see that and approve it,
8 this will be closed. It should be relatively easy to
9 close.

10 And that is the open item. As far as the
11 confirmatory item, it is basically, once we have the
12 approved version of the tech spec PRA methodology, that
13 that reference will be specifically incorporated in the
14 next revision to the tech specs in there. So, it is
15 a rather simple thing.

16 For the most part, other than
17 instrumentation and ultimate heat sink, they have been
18 incorporated by reference. So, the tech specs are
19 accepted.

20 CHAIRMAN STETKAR: Okay. Thank you.

21 Any questions for the staff, Chapter 16?

22 (No response.)

23 No?

24 Again, this ends another topic. So, I will
25 take the opportunity to ask if we have any comments from

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1 members of the public regarding COLA technical
2 specifications.

3 (No response.)

4 Hearing none, we will now hear from Luminant
5 on loss of large area events.

6 MR. MONARQUE: Mr. Stetkar?

7 CHAIRMAN STETKAR: Yes?

8 MR. MONARQUE: We need to close the session
9 for members of the public.

10 CHAIRMAN STETKAR: Okay. We will do that.

11 So, can we make sure that the bridge line is closed
12 completely, Girija?

13 And I will ask MHI and the staff to make
14 sure that people in the room are appropriately cleared
15 for this session.

16 For the record, let's recess briefly while
17 we reconvene here. I don't want to give anybody a break.

18 It is too early for a real break. So, just hang around
19 while the staff gets -- just be aware that if there are
20 two of us in our mind or in the room, I am going to whack
21 this gavel.

22 (Laughter.)

23 (Whereupon, the above-entitled matter went
24 off the record at 1:30 p.m. and resumed at 2:28 p.m.)

25 CHAIRMAN STETKAR: We are back in session.

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1 And as I understand it, at least at the
2 beginning, this session is open. Is that correct as
3 far as MHI is concerned?

4 DR. CURRY: Yes, sir.

5 CHAIRMAN STETKAR: If we get into detailed
6 questions that delve into areas that you feel it is
7 necessary to close the session, please let us know and
8 we will deal with those appropriately, because I know
9 the PRA report and details in there are proprietary.
10 So, we will rely on you to alert us to topics where
11 we are getting into treading on proprietary information.

12 And with that, it is yours.

13 DR. CURRY: Thank you, Mr. Chairman.

14 My name is Jim Curry. So, we are here to
15 discuss Chapter 19 DCD. And on the panel in front of
16 you is Dr. Tanaka, who you saw this morning; Mr.
17 Nirasawa, and Mr. Ed Wiegart. And we have additional
18 folks here to support us as necessary. Dr. Tanaka and
19 Mr. Nirasawa from MHI and our PRA subject matter experts;
20 Ed Wiegart is MNES, also a subject matter expert in PRA.

21 We heard your comments this morning, you
22 know, about the transition from a design certification
23 PRA to one that is suitable for plant application
24 purposes. We also heard comments on Expert Panel and
25 peer review. So, we welcome the additional detail that

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1 you mentioned, and we brought people up to the table
2 that we thought would be best focused on that issue.

3 We also have Mr. Goda, Hiroshi Goda, from
4 MHI here, when we get to Level 2 in severe accident
5 analysis, but we figured we would probably be starting
6 on Level 1. Just our intuition.

7 (Laughter.)

8 Okay. So, thank you for the comments this
9 morning. Based on the comments this morning, I think
10 we can probably expect some discussion on some of our
11 slides. And we welcome that additional discussion.

12 So, let's just start as we did with other
13 sections. Chapter 19, for those that aren't intimately
14 familiar, has four major sections. 19.0 is the first
15 major section, and it summarizes PRA objectives, the
16 conclusion that the US-APWR meet safety goals, and is
17 of a quality and detail to support risk insights at the
18 design certification stage, and key references.

19 19.1 provides Level 1 and Level 2
20 probabilistic analysis results and uses of the PRA, one
21 of which is to support the RAP, which we discussed this
22 morning.

23 The DCD evaluates internal events, flood,
24 fire, and seismic. So, our understanding is that the
25 Seismic Margins Analysis, which is in the DCD, is not

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1 going to be discussed today. That will be discussed
2 in concert with Chapter 3.

3 So, we will be focusing on the internal
4 events, at-power PRA, internal floods, and internal
5 fires.

6 Section 19.2 is the severe accident
7 evaluation.

8 CHAIRMAN STETKAR: Jim, I'm sorry.

9 DR. CURRY: Yes, sir?

10 CHAIRMAN STETKAR: Are you going to talk
11 about, also, the low power and shutdown part of the PRA?

12 DR. CURRY: Loss of --

13 CHAIRMAN STETKAR: Low power and shutdown.

14 DR. CURRY: Oh, yes, absolutely, because
15 you get low power at shutdown --

16 CHAIRMAN STETKAR: Because all you said was
17 "at power".

18 DR. CURRY: Yes.

19 CHAIRMAN STETKAR: Okay.

20 DR. CURRY: Yes, sir.

21 CHAIRMAN STETKAR: Thanks.

22 DR. CURRY: Yes, that is on the agenda.
23 Thank you, sir.

24 And then, 19.3 summarizes COL items
25 resulting from the PRA and is kind of the transition

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1 point to the COL actions to maintain, update, and upgrade
2 the PRA over time.

3 All right. There are a couple of
4 appendices; for example, the Aircraft Impact Assessment
5 Summary, which is outside of the scope of this discussion
6 as well.

7 Relevant Technical or Topical Reports,
8 there are three, which we believe the staff has: the
9 PRA itself, which is 07030; a report, 08004, which was
10 performed for SAMDA purposes and addresses, also,
11 consequences, and another MUAP which addresses the
12 treatment of hydrogen in containment.

13 Are there any other Topical Reports
14 associated with the PRA?

15 MR. SPRENGEL: Real quick on that, Jim, to
16 interject, just so the members are aware, we are adding
17 this slide at the request of the staff and we will use
18 this consistently going forward. Sorry, the previous
19 slide on the reports, just to make sure that we have
20 a good understanding of where the reports are being
21 applied within the chapter. So, we are developing that
22 going forward.

23 DR. CURRY: Okay. Level 1 PRA, the PRA
24 demonstrated that the US-APWR evolutionary design meets
25 the probabilistic safety goals. The PRA identified

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1 design improvements, which we will summarize for the
2 Committee.

3 The PRA model was developed consistent with
4 the guidance provided in the Reg. Guides and the ANSI
5 standard, which the Committee referred to this morning.

6 At the design certification stage, bounding
7 assumptions were used when detail was not available;
8 for example, specific plant procedures.

9 We would refer you to Table 19.1-119, which
10 is a summary in the DCD of important assumptions and
11 risk insights.

12 Where appropriate, there are COL action
13 items that are identified. And again, there is a
14 summary in Section 19.3, but the COL action items are
15 also identified in that table.

16 The PRA was developed with good
17 administrative controls, independent review, a
18 corrective action. There is a qualification program
19 for PRA analysts. The model was peer-reviewed some
20 number of years ago, and the peer review included outside
21 parties, independent outside experts.

22 CHAIRMAN STETKAR: Is there a peer-review
23 report available?

24 DR. CURRY: Yes, Dr. Tanaka, I believe we
25 do have one, and I think we have given it to the staff.

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1 CHAIRMAN STETKAR: Have all of the findings
2 from that peer review been addressed and resolved in
3 Revision 3 of the PRA?

4 DR. TANAKA: Yes. Of course, there are
5 requirements that are not applicable to design plans,
6 like operating experiences.

7 CHAIRMAN STETKAR: Sure, I understand
8 that. But, in terms of any technical findings from that
9 peer review regarding the models or the data or the event
10 sequence model, the systems model, the data, and so
11 forth, regardless of operating experience, all of those
12 have been resolved in --

13 DR. CURRY: Rev. 3 of the PRA.

14 CHAIRMAN STETKAR: -- reflected in DCD Rev.
15 3?

16 DR. TANAKA: Yes, it is reflected in 3, yes.

17 CHAIRMAN STETKAR: Okay. Thank you.

18 MEMBER REMPE: Okay. So, Level 1 and 2
19 were reviewed, and that includes the Severe Accident
20 Analysis, too? And what about Level 3, because it was
21 issued after that date? And is there a plan to have
22 it reviewed?

23 DR. TANAKA: The Severe Accident Analysis
24 was not subjected to peer review; Level 3 was not. Only
25 Level 1 and Level 2, yes.

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1 MEMBER REMPE: Is there a plan to have those
2 other items peer-reviewed?

3 DR. TANAKA: For the DCD, no.

4 CHAIRMAN STETKAR: And one other question.
5 When the peer review was done, was the peer review
6 performed with consideration of Capability Category 1,
7 2, or 3 from the ASME/ANS PRA standard?

8 DR. TANAKA: It did not have like a target.
9 We knew that for the DCD. And so, it was not -- in
10 this case, it was Category 1.

11 CHAIRMAN STETKAR: Category 1?

12 DR. TANAKA: One, yes.

13 CHAIRMAN STETKAR: Okay.

14 MEMBER BLEY: But it was done against the
15 standard?

16 DR. TANAKA: Yes, it was done against the
17 standard.

18 MEMBER BLEY: But only Category 1?

19 DR. TANAKA: Only 1.

20 MEMBER BLEY: Okay.

21 CHAIRMAN STETKAR: It is a big jump between
22 Category 1 and 2, and that is why I am trying to
23 understand in terms of technical quality.

24 DR. TANAKA: I will try to answer as correct
25 as possible. So, basically, yes, the Category 1, but

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1 if it is better, then, of course --

2 CHAIRMAN STETKAR: But let me see if I can
3 understand. Was it reviewed specifically against
4 Capability Category 2 requirements? In other words,
5 were the findings organized against Capability Category
6 2 or were they organized against Capability Category
7 1? And findings said, for example, it is deficient
8 because it does not meet Capability Category 1
9 requirements here, but it is better than Capability
10 Category 1 in some other areas? That is different than
11 saying I review it against Capability Category 2.

12 DR. TANAKA: I will have to check that
13 out --

14 CHAIRMAN STETKAR: Okay.

15 DR. TANAKA: -- to be more precise.

16 CHAIRMAN STETKAR: I would appreciate if
17 we can get some feedback on that because it may affect
18 some of our questions later. Thank you.

19 DR. CURRY: Okay. We understand that
20 action.

21 The PRA scope --

22 MEMBER SCHULTZ: Just one moment, Jim.

23 DR. CURRY: Yes, sir?

24 MEMBER SCHULTZ: On that last slide, the
25 qualification program for PRA analysts, could you expand

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1 on what that entails and how many analysts have been
2 through the qualifications program?

3 DR. CURRY: So, Nirasawa-san, number of
4 analysts that have been qualified?

5 MR. NIRASAWA: Yes. Number of PRA
6 analysts is 15 now.

7 MEMBER SCHULTZ: And the program, can you
8 describe some elements of the program at a high level?
9 What is defined as a qualification, the major elements
10 of the qualification program?

11 DR. TANAKA: Well, of course, we consider
12 the experience in the area of PRA which he or she will
13 be working on and the training. Training, but it means
14 it is in MHI, being trained for that area.

15 MEMBER SCHULTZ: Is it a mentoring process?

16 DR. TANAKA: It is mostly a mentoring
17 process.

18 MEMBER SCHULTZ: Okay. And then, a
19 qualification program with a mentor to demonstrate
20 capability for a particular application? You mentioned
21 that an individual might be working on a particular part
22 of the PRA.

23 DR. TANAKA: Right, yes.

24 MEMBER SCHULTZ: Okay.

25 DR. TANAKA: So, he or she has to have

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1 experience in that area. Some do not cover all of the
2 PRA aspects. We define which area a person has
3 experience in, so that we have the right person working
4 on the PRA area.

5 MEMBER SCHULTZ: Good. Thank you.

6 DR. CURRY: The scope, as we discussed
7 before, but just to kind of clarify, the DCD PRA will
8 address internal events, both at-power and low-power
9 shutdown conditions as well as internal flooding,
10 internal fire, and seismic. Seismic is not within the
11 scope of today's discussion. Again, it will be part
12 of Chapter 3. Then, other external events are handled
13 in the SAR by the COL applicant.

14 In some cases, a bounding assumption was
15 used, notably where you see the black triangles. In
16 calculating the LRF values, the containment was assumed
17 to be open to the environment.

18 The uses of the PRA, as you might expect,
19 were to identify and eliminate weaknesses in the design.

20 The PRA, in the course of the US-APWR development,
21 proposed and implemented design changes to reduce plant
22 risk. So, some examples are the first bullet, alternate
23 charging pump cooling. The charging pump is important
24 to protecting RCP seals. So, an alternate method was
25 identified to provide charging pump cooling.

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1 On the second bullet, I would like to make
2 a correction, if you don't mind. On the second bullet,
3 instead of the locked closed state for the emergency
4 letdown isolation valve, that should read "RHR full-flow
5 test line valve". And that is what is locked closed,
6 particularly relevant to the low-power shutdown
7 condition. And the intent is to avoid diverting our
8 HR flow back to the RWSP. It is relevant in the fire
9 because you could have a hot short. So, that should
10 be "RHR full-flow test line".

11 The third bullet, another design insight
12 was to prevent a loop with the turbine building, in the
13 event of a turbine building fire. So, electrical rooms
14 were separated with fire barriers and, also, the offsite
15 power ducts had some fire separation implemented.

16 Another insight from the flooding
17 perspective was the separation of ECCS pumps and
18 component cooling water pumps. The ECCS pumps are
19 separated by train. The CCW pumps are separated by
20 subsystems. Subsystem in the case of CCW is two trains.

21 Another use, as we heard this morning, was
22 input to the Reliability Assurance Program. So, from
23 a Chapter 19 perspective, we probably aren't going to
24 get into a whole lot more detail unless the Committee
25 wants to comment. We did hear your comments this

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1 morning.

2 So, we would be happy to take any additional
3 comments.

4 CHAIRMAN STETKAR: I don't know when best
5 to raise this question. Please defer it if you think
6 it is better to discuss it in a different part of the
7 presentation.

8 Regarding that last bullet -- and you heard
9 earlier comments -- but there are many things in the
10 plant that are either not modeled at all in the PRA or
11 are modeled very simplistically. An example is, in
12 fact, the main feedwater system where recovery of main
13 feedwater has a value of .1. There is no model for the
14 main feedwater system. There is no model for the
15 non-essential power systems.

16 And there are a lot more specific details,
17 but I want to try to keep this at a fairly high level,
18 at least at this stage of the discussion. How do those
19 modeling decisions affect the relative importance now
20 of equipment that is explicitly modeled in the PRA versus
21 the actual risk importance of equipment that is not
22 modeled at all? And when it is not modeled, in some
23 cases it is assumed to be failed and in some cases it
24 is assumed to be perfectly available. So, not modeled
25 is simply not modeled.

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1 And my concern is, from the purposes of the
2 Reliability Assurance Program, at, again, a high level,
3 if I have modeled something and it has a relatively high
4 importance because I can actually test the PRA and run
5 out all of those importance measures and all of that
6 stuff, I have not modeled something else. So, I don't
7 have any numerical measures for it.

8 Perhaps if I put it in the PRA, I would find
9 that, indeed, it is somewhat important to risk. In
10 other words, its Risk Achievement Worth or its
11 Fussell-Vesely importance are not zero. And indeed,
12 that equipment might be elevated in importance to risk
13 compared to where it is now; it is completely
14 unimportant. And conversely, some of the importance
15 of the systems and equipment that I have modeled might
16 be reduced. And that rearrangement of relative
17 numerical importance could affect decisions regarding
18 the structure of the Reliability Assurance Program
19 lists. At a high level, that is sort of the issue that
20 I would like to address now in terms of this is
21 completeness of the existing PRA models and how they
22 might affect that last bullet on your slide.

23 DR. CURRY: Let me make a couple of points,
24 and then turn that question over to Dr. Tanaka.

25 A couple of points, first, though, from a

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1 top-level perspective. You know, what to do simplified
2 modeling on, as you know, versus what to ignore is an
3 important value judgment right off the bat.

4 CHAIRMAN STETKAR: Yes.

5 DR. CURRY: And so, that would be probably
6 an acceptable approach, clearly, at the design
7 certification stage.

8 The second point is recall those risk
9 measures, the Fussell-Vesely and the RAW value, I think
10 the US-APWR uses those measures where other plants might
11 have chosen different threshold values. So, we end up
12 with a list that is pretty broad in the RAP.

13 CHAIRMAN STETKAR: I am aware of one design
14 certification that used others. I think that everybody
15 else has used the same values you have used.

16 DR. CURRY: Right, but, you know, there is
17 an argument to be made for --

18 CHAIRMAN STETKAR: IBF. Yes. Yes, we
19 have plowed that ground.

20 DR. CURRY: Excellent.

21 CHAIRMAN STETKAR: You are using the
22 values, the good news is you are using the values that
23 are more universally used --

24 DR. CURRY: Right.

25 CHAIRMAN STETKAR: -- and you are using

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1 values that are consistent with the values that are
2 typically applied in the --

3 MEMBER SHACK: Maintenance Rule.

4 CHAIRMAN STETKAR: -- thank
5 you -- Maintenance Rule importance determination. So
6 that you don't face this kind of discontinuity that some
7 others have faced.

8 DR. CURRY: That's right, yes.

9 CHAIRMAN STETKAR: So, you are at least in
10 line.

11 DR. CURRY: Right. Thank you, sir.

12 CHAIRMAN STETKAR: Recognizing that,
13 indeed, arguments can be made otherwise.

14 DR. CURRY: Exactly. With that kind of
15 backdrop, then, I guess your question is, look, if we
16 assume that a system or a component is completely
17 available or is just ignored, how much have we
18 potentially modified or could modify the resultant
19 importance measures?

20 CHAIRMAN STETKAR: Right. Right. And
21 the reason I bring it up is, in terms of a very high-level
22 determination of, are there any particular, let's call
23 them, outliers in this design that are very, very
24 important to risk that you would like to address? Or
25 is the overall level of risk within nominal acceptance

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1 goals?

2 One might make decisions in one direction
3 to achieve those goals; whereas, those decisions might
4 mask other things that are more important to having a
5 better balanced set of understanding of relative
6 importance for, in particular, the Reliability
7 Assurance Program.

8 DR. CURRY: So, maybe the first way to
9 attack that is just kind of speak about the completeness
10 and the thought process of what was in and not considered
11 in the PRA initially.

12 CHAIRMAN STETKAR: And if you would rather
13 address that as we kind of go through the different
14 elements, that is perfectly fine. I mean however you
15 feel it is better to address that. But that is one of
16 the higher-level concerns that I have.

17 DR. CURRY: I think it would be appropriate
18 to just hit it now.

19 DR. TANAKA: I am thinking which to start
20 with. For the components that are not in the PRA, but
21 we know the impact of the failure of that component has
22 impact similar or the same to what is modeled in the
23 PRA. For instance, we have a human action that is
24 important. And all the equipment used relied on for
25 that human action may not be all modeled in the PRA.

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1 It is too detailed probably.

2 In that case, we look at the importance of
3 human action. We can kind of estimate at least for the
4 Risk Achievement Worth of the equipment that is relied
5 on for the human actions. Because an indicator, for
6 example, if it has failed, that could result in a failure
7 of the human action. That means probably the Risk
8 Achievement Worth will be the similar value.

9 And if the PRA team with analysts identifies
10 those kinds of components which are not modeled, and
11 which can be estimated from other important value of
12 other components or human actions, we assume that it
13 has the same importance value. And if it is above the
14 criteria, if you enter it in the RAP, it will be.

15 CHAIRMAN STETKAR: Let me follow that
16 because an example that I can point to there that you
17 might say, although it is not characterized as a human
18 action, is the .1 value that is in there for main
19 feedwater --

20 DR. TANAKA: Yes, okay.

21 CHAIRMAN STETKAR: -- restoration of main
22 feedwater. And now, it is not characterized as human
23 action, but let me think of it as a human action right
24 at the moment.

25 Suppose that if you had actually modeled

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1 the main feedwater system and modeled a human action
2 to restore it within a particular period of time, suppose
3 that the reliability of successfully restoring main
4 feedwater to the steam generators was 10 to the minus -- I
5 will pick a crazy number -- 10 to the minus 10. You
6 have absolutely perfect operators and a really good
7 system. Wouldn't that change the overall results of
8 your PRA from many transient events, because you
9 wouldn't challenge bleed-and-feed cooling. The
10 importance of bleed-and-feed cooling, the importance
11 of the SDVs would not be as important to your overall
12 risk results. And you wouldn't challenge containment
13 heat removal, so it challenges the CS RHR, and alternate
14 containment heat removal wouldn't be as important,
15 simply because main feedwater was a lot more reliable
16 than the .1 number that is in there.

17 DR. TANAKA: Yes, that's --

18 CHAIRMAN STETKAR: So, here is an example
19 where you threw a number in there that you can call a
20 human reliability number, but it really isn't because
21 you didn't do a human reliability analysis. And it may,
22 for a large number of initiating events, be numerically
23 conservative, quite conservative. It may be optimistic
24 for others because there might be some buried in there
25 for which recovery of feedwater is not possible. And

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1 that is an example of my concern.

2 DR. TANAKA: This may be a different one
3 of that -- in other words, it is kind of a rough
4 estimation. It was based errors that can lead to lost
5 power, failure to recover the main feedwater. It is
6 not a value just without any basis.

7 So, it shouldn't be like the magnitude is
8 different, you know. Like, or is magnitude different
9 from what it would be if you had been modeling detail?
10 So, that is one.

11 And also, when --

12 CHAIRMAN STETKAR: And that analysis is
13 based on -- I couldn't find that analysis anywhere.

14 DR. TANAKA: It is kind of a simple
15 analysis. It is simple. We just listed out what kind
16 of failures that can lead to failure of the main
17 feedwater recovery, and we gave a bounding value which
18 is not so far, but it is bounding enough so that, if
19 we have missed some closes, it will not bump up that
20 value. That is one.

21 And the contribution of that event to the
22 total core damage frequency is not much as high -- if
23 that failure contributes, dominates the risk, of course,
24 it can distort the other importance values. But it was
25 not high enough to distort the other risk-important

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1 values.

2 CHAIRMAN STETKAR: But if you made it
3 perfect --

4 DR. TANAKA: Yes.

5 CHAIRMAN STETKAR: -- you would never need
6 to go to bleed-and-feed. So, anything to do with the
7 SDVs for bleed-and-feed, anything to do with heat
8 generation into the containment during bleed-and-feed
9 scenarios would disappear from the risk results. You
10 need to think about making the effects of not only how
11 important is it if it fails; you need to think of how
12 important is it if it succeeds, because that can change
13 the overall risk profile.

14 And I understand what you are saying in
15 terms of, given the .1 value, it is not very important.

16 And even if we made it a lot worse, it wouldn't make
17 things too much different in terms of overall risk
18 profile, if I think of it that way. But if you made
19 it perfect, how would things change?

20 Now it, obviously, is not perfect.

21 DR. TANAKA: Yes.

22 CHAIRMAN STETKAR: But we don't know where
23 it is between .1 and perfection.

24 DR. TANAKA: Well, that can be estimated
25 by the Fussell-Vesely value of that basic event because

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1 that gives the contribution compared to the core damage
2 frequency. So, unless that Fussell-Vesely value of
3 that failure of main recovery is high or close to like
4 0.-something, 10 percent or more, even if we made it
5 perfect, it should not distort the whole risk profile.

6 DR. CURRY: It is essentially what the
7 Fussell-Vesely value does, right?

8 CHAIRMAN STETKAR: Yes.

9 DR. CURRY: It assumes that the probability
10 of failure is zero.

11 CHAIRMAN STETKAR: That is one way of
12 thinking about it. That is one way of thinking about
13 it, yes. Okay.

14 Go on. I kind of interrupted you. So, in
15 one case, you are saying that in some places you have
16 effectively used human actions as a surrogate to things
17 that aren't, for pieces of equipment that aren't
18 modeled?

19 DR. TANAKA: Exactly, yes.

20 CHAIRMAN STETKAR: Are there other places
21 where you have not modeled things where you have not
22 used human actions as a surrogate?

23 DR. TANAKA: Basically, where I did not use
24 it? So, okay. Another example is what we had in the
25 morning session, the accumulator. We don't model the

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1 failure of the accumulator to attack itself. So, that
2 does not appear in the cut sets or the importance.

3 But we know that the function of that
4 accumulator should be important because we model, for
5 example, the check valves after the accumulator, and
6 it has a high importance value. So, we know that the
7 accumulator itself, it should be important. And that
8 is how we identified that particular component, SSC.
9 So, that is another example.

10 CHAIRMAN STETKAR: What about something
11 like -- and I will bring it up again because I like
12 ventilation -- what about main control room ventilation?

13 DR. CURRY: Could you just elaborate a
14 little bit?

15 CHAIRMAN STETKAR: Main control room
16 ventilation is not modeled in the PRA. This morning,
17 during some of the discussions we have had, it was noted
18 that, well, it is not modeled because, even if it gets
19 really hot in the main control room, the operators can
20 go to the remote shutdown console. Okay, maybe that
21 is certainly the case.

22 I don't know whether there are some
23 contributions from chilled-water failures, for example,
24 that would disable ventilation for both the main control
25 room and the remote shutdown console area, but there

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1 may be. There may be some electric power failures that
2 could do that.

3 None of that is modeled in the PRA. There
4 is not a surrogate basic event that says we fail if
5 ventilation fails and the operators don't do anything.
6 We don't know, if they do relocate, whether they can
7 successfully operate the equipment from that alternate
8 location. It is simply not modeled. It is not an
9 example where, you know, my analogy for main feedwater
10 where you can say, well, that .1 is perhaps a surrogate
11 for operator actions and may be bounding for the
12 equipment. It is not one of those. It is not something
13 where the hardware reliability isn't modeled, but there
14 is something else that is an equivalent, like the
15 accumulator. That is another example of something that
16 is just not there.

17 And I don't know how important that might
18 be because I have no way of measuring the importance
19 of that, either the operator actions or the equipment,
20 or anything. It is just not there. And any support
21 systems for that, electric power, DC power, AC, you know,
22 chilled water, and so forth. It is just simply not
23 there.

24 And there are some other examples. As I
25 said, I spent quite a bit of time looking at this. There

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1 are some other examples. Ventilation is one of the key
2 areas that I looked at that just mostly isn't modeled.

3 And in terms of high-level concerns for the
4 DCD, do I believe that ventilation failures will make
5 two orders of magnitude difference in the core damage
6 frequency? Certainly I don't. Do I believe that
7 explicit modeling of ventilation and its dependencies
8 could change the nature of the contributors to the risk
9 profile? I do. But I have no reason to disbelieve that
10 belief. I haven't been presented with any evidence that
11 convinces me otherwise, that I believe that it could.

12 And part of the PRA ought to, I would think,
13 address those types of concerns. As I said, in terms
14 of balancing safety-related, the PRA, with the exception
15 of the essential chilled-water system, does, as best
16 as I can tell, examine all safety-related things to a
17 greater or less extent. It doesn't do so well in
18 non-safety-related areas.

19 And in my experience with highly-redundant
20 four-train plants, there have been a lot of surprises
21 that people that have found, that if you model the
22 secondary systems, No. 1, they are good. They reduce
23 the importance of the safety-related systems. No. 2,
24 they are more important to risk than you would expect
25 them to be, if you hadn't modeled them. And so, you

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1 risk this balance between safety versus non-safety.
2 Relative risk importance can change an awful lot in ways
3 that, unless you model it, you don't appreciate.

4 And again, I am not so much concerned on
5 whether it is 1.0 times 10 to the minus 6 or .100
6 conditional containment value probability. It is more
7 in terms of feeding forward into actual plant operations
8 where they are going to be implementing the Reliability
9 Assurance Programs to make sure that, indeed, that list
10 of equipment that is being fed forward, that Luminant
11 is taking as their initial conditions, has the
12 appropriate mix of things in it.

13 MR. SPRENGEL: I am going to ask for
14 clarification. That was a long discussion.

15 CHAIRMAN STETKAR: It is.

16 MR. SPRENGEL: And I guess there is a
17 general point and a specific --

18 CHAIRMAN STETKAR: The PRA is not complete.
19 It is not a complete PRA of the plant. It is not a
20 complete PRA of the plant design, if you want it on the
21 record in very specific terms.

22 It does not model a number of systems that
23 exist in the plant. It does not model the effects of
24 failures of those systems. And it does not model the
25 effects of possible successes of other systems that do

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1 exist in the plant that might change the overall risk
2 profile if they were included in the PRA.

3 Is it okay for the purpose, the narrow
4 purposes of a design certification to say, is the core
5 damage frequency from this plant 10 to the minus 2 or
6 10 to the minus 100? Yes, it is okay for that. Yes,
7 it is somewhere between those numbers.

8 But a bit of my concern is if it is being
9 relied on very strongly to populate that Reliability
10 Assurance Program list, it may be overemphasizing the
11 importance of some safety-related systems because
12 non-safety systems are not modeled, and it may not
13 recognize the importance of some systems, safety or
14 non-safety, that are not modeled at all because they
15 are just not modeled.

16 DR. CURRY: A couple of points. I think
17 we should revisit why it was not modeled, you know, and
18 then, because ultimately we may conclude that there is
19 some engineering judgment that is applied --

20 CHAIRMAN STETKAR: Right.

21 DR. CURRY: And if we are never
22 allowed -- not "we," but anybody in general -- if we
23 aren't allowed to provide some engineering judgment,
24 then, literally, you end up with every single thing
25 modeled --

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1 CHAIRMAN STETKAR: Sure.

2 DR. CURRY: -- which would be complete, as
3 you say.

4 But, Dr. Tanaka, can you comment why the
5 ventilation system was not elected to be modeled?

6 DR. TANAKA: Yes. As you already
7 explained, yes, we, the PRA team, we considered that
8 we have a chance, if we evaluate to the remote shutdown
9 console, which provides functions -- you can control
10 almost everything, the same with the main control
11 room -- then that will allow us to safely shut down the
12 plant as we were in the main control room.

13 And we made a judgment that that action,
14 moving from evacuating from the main control, is highly
15 reliable. And therefore, it is our judgment that, even
16 if we did not model the failure probability, that will
17 not affect the core damage frequency. That was the
18 judgment behind why it was not modeled in the PRA.

19 MEMBER BLEY: Two things strike me, and I
20 will jump into this just a little. One is the one John
21 mentioned earlier. If, in fact, it is the same
22 chilled-water trains that are cooling the remote
23 shutdown area as the control room, and that is the reason
24 the control room heated up, the assumption that you are
25 dandy going over there might not hold up.

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1 DR. CURRY: Yes, that's true.

2 MEMBER BLEY: The other is that is one
3 ventilation system. I think you modeled at least the
4 chillers for one of the other systems. But did you do
5 any kind of analysis to be convinced that loss of HVAC
6 in various spaces around the plant won't lead to
7 equipment failures? You know, rooms that house the
8 electrical equipment such that you might have things
9 tripping off or, if it has got solid-state electronics,
10 you might actually enter failure states for those?

11 DR. TANAKA: Yes. We did a room heat up
12 calculation.

13 MEMBER BLEY: For every room?

14 DR. TANAKA: Every is different, yes, but
15 for the electrical room, yes; the I&C room, yes.

16 CHAIRMAN STETKAR: Did you also account for
17 temperatures inside the cabinets or just bulk air
18 temperature in the room, taking the heat source and
19 configuration of size of the room and heat sinks in the
20 walls?

21 DR. TANAKA: I can't answer the details of
22 this right now. I don't have the information --

23 CHAIRMAN STETKAR: Are those room heat up
24 calculations documented anywhere? I couldn't find
25 them.

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1 DR. CURRY: It is the subject of an RAI.

2 CHAIRMAN STETKAR: It is?

3 DR. CURRY: Right. And there is a long
4 list, and it is actually an item we are still discussing
5 with Chapter 9.

6 CHAIRMAN STETKAR: There have been events
7 that have occurred at real plants where, because of
8 elevated temperatures inside cabinets, especially
9 digital I&C cabinets that tend to have their own power
10 supplies inside there, so they are the heat generators,
11 have gotten quite warm, despite the fact that the bulk
12 air temperature in the room met all of the requirements.

13 DR. CURRY: Right. It is a room-by-room
14 calculation. We have submitted an RAI response,
15 compared the requests to the EQ list. We are still
16 discussing with the staff the technical details of that
17 calculation.

18 CHAIRMAN STETKAR: Were they run out to
19 equilibrium steady-state temperature? Because I saw
20 some --

21 DR. CURRY: Twenty-four hours I think.

22 CHAIRMAN STETKAR: Not 24 hours because I
23 saw those words in many places that said, within the
24 PRA mission time, temperature did not exceed design
25 limits. Well, the equipment doesn't care about the PRA

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1 mission time. So, if the temperature was still
2 increasing at 24 hours, those temperature calculations
3 ought to be taken to steady-state equilibrium
4 temperatures. And even if those occur at -- pick a
5 number -- 30 hours, there is a problem.

6 DR. CURRY: Right.

7 MEMBER BLEY: Because you might still be
8 operating.

9 (Laughter.)

10 CHAIRMAN STETKAR: You might be operating
11 or you still might need to take away decay heat.

12 MEMBER BLEY: You might need to take away
13 decay heat.

14 DR. CURRY: We appreciate the point. That
15 is what we did in the RAI response.

16 CHAIRMAN STETKAR: You did, you took them
17 out to --

18 DR. CURRY: Right.

19 MEMBER BLEY: But you don't know if you
20 looked inside the cabinets? Because that is kind of
21 a crucial --

22 DR. CURRY: I know it was a comparison to
23 the EQ profile.

24 MEMBER BLEY: And did you
25 require -- because we haven't seen any of this -- did

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1 some of your calculations indicate that you would need
2 to take actions, like rig pans or anything, to cool
3 rooms?

4 DR. CURRY: I believe there is one room that
5 requires an operator action.

6 MEMBER BLEY: And is that modeled?

7 DR. CURRY: Well, when you say, "Is it
8 modeled" --

9 MEMBER BLEY: The operator action.

10 DR. CURRY: Without any operator action,
11 you know, the heat up calculation indicated that no
12 operator action was required. There was a room, if I
13 recall -- and I would have to pull up the RAI -- that,
14 you know --

15 MEMBER BLEY: What did you use for the worst
16 ambient temperature condition when you started this?
17 I mean, is this for a plant in the tropic or --

18 DR. CURRY: I think I would have to pull
19 up the RAI, but I am happy to pull it up.

20 MEMBER BLEY: Well, if all of that is
21 covered in the RAI, I guess we will see that eventually.

22 DR. CURRY: We can get our hands on it --

23 MEMBER BLEY: I don't know how much is there
24 because I haven't looked at that.

25 DR. CURRY: We can get our hands on it

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1 before we leave tonight. I am sure we have got it
2 somewhere.

3 CHAIRMAN STETKAR: I think we would like
4 to see that RAI. Has the staff reviewed the RAI yet
5 or is it --

6 DR. CURRY: The staff has reviewed it. It
7 was the subject of an audit. And the staff is continuing
8 to review it.

9 CHAIRMAN STETKAR: It is still in review?
10 Okay.

11 DR. CURRY: Right. We submitted it. The
12 staff had some comments on the methodology.

13 CHAIRMAN STETKAR: Okay. I just didn't
14 want to insert us into the middle of something until
15 the staff got done reviewing it.

16 MEMBER BLEY: That's fine. That's fine,
17 yes. I didn't, I mean, if it is in there and it is
18 addressing all these issues, we will see it, yes,
19 eventually.

20 CHAIRMAN STETKAR: Okay. In the interest
21 of time -- I mean, the good news is we are ahead of
22 schedule; the bad news is this is PRA.

23 (Laughter.)

24 So, why don't you continue with your
25 presentation? I think we sort of elaborated, at least

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1 I have on it, on a couple of my general concerns.

2 DR. CURRY: And that is great, Mr.
3 Chairman, you know, because if we can get through a
4 number, tonight if we have some homework, it will give
5 us an opportunity.

6 CHAIRMAN STETKAR: Yes, yes.

7 DR. CURRY: All right. Design features.
8 This slide is kind of a summary of design features to
9 reduce the core damage frequency. Four-train safety
10 injection or high-head injection system with direct
11 vessel injection, direct lines into the vessel.
12 Four-train Class 1E GTGs, gas turbine generators, for
13 AC power.

14 There is no low-head injection required,
15 low-head injection system required, because of the use
16 of the advanced accumulator. And there is no switchover
17 from an injection to a recirc mode because of the
18 in-containment refueling water storage pit.

19 Additional design features to reduce the
20 core damage frequency, the alternate AC generators,
21 although they are not Class 1E themselves, they are
22 within a Seismic Class 1 structure, which provides
23 protection from site hazards, such as high winds.

24 Upgrade the piping for the RHR system and
25 the flow path of the RHR system reduces the potential

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1 for interfacing systems LOCA. I started to say event
2 tree, the old WASH-1400 term.

3 (Laughter.)

4 Four trains of emergency feedwater, two
5 motor-driven, two turbine-driven. So, the emergency
6 feedwater system is diverse.

7 And as I mentioned earlier, the charging
8 pump can be cooled using the non-essential chilled-water
9 system or the fire protection system, and that is
10 important for cooling.

11 MEMBER BLEY: Yes, No. 2 up there, I
12 couldn't -- it depends on where you look, I guess, I
13 have heard. What I read was that the upgraded piping
14 system has a higher design pressure than in most PWRs,
15 which is 600 pounds in most of them. There was a hint
16 somewhere that it is designed to be capable of handling
17 full RCS pressure. What is the truth? I didn't see
18 it laid out.

19 DR. CURRY: I think there's a couple of
20 answers. The design pressure is 900.

21 MEMBER BLEY: Nine hundred? Okay. Thank
22 you.

23 DR. CURRY: Right, but I think we want to
24 talk about -- and Hamamoto-san can help me -- but I
25 believe the rupture pressure of the piping is very high.

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1 That is No. 1.

2 And No. 2, we wanted to talk about the flow
3 back --

4 MR. HAMAMOTO: This is Hiroshi Hamamoto.

5 DR. CURRY: Hamamoto-san, yes.

6 MR. HAMAMOTO: My understanding is the
7 design piping is 900. We set the actual normal
8 operating pressure to 50.

9 MEMBER BLEY: I didn't follow that.

10 MR. HAMAMOTO: Yes. If we design RHR
11 piping, if we decide a 900-pound rating, if we use
12 separating piping, we stand normal pressure, 2,250.

13 MEMBER SHACK: He is going to allow to
14 deform plastically, but --

15 MR. KIPPER: My name is Scott Kipper with
16 MNES.

17 I believe this is coming from a URD
18 requirement, which is discussing the ultimate rupture
19 strength of the material. So, it does allow for plastic
20 deformation. It is the ultimate strength of the
21 material, not your normal service ratings or allowable
22 stresses. But it is an ultimate strength of the piping.

23 CHAIRMAN STETKAR: That's good for nice
24 things that I consider a pipe. What about things like
25 pumps and valves and connections to heat exchangers,

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1 and all of those other things that aren't a pipe? Are
2 they also designed and rated for that pressure?

3 So, for example, a pipe might not rupture.

4 But if I blow the bonnet off of a valve, it is still
5 not a good day in the electric faculty.

6 MEMBER BLEY: Or the seals out of a pump.

7 CHAIRMAN STETKAR: Or the seals out of a
8 pump.

9 DR. CURRY: Yes, they are all designed to
10 900. But I think we also want to talk about the flow
11 path and the likelihood that --

12 MR. KIPPER: Correct. We will need to
13 follow up on components that would be non-uniform
14 geometries or non-simple geometries, basically, your
15 components that will be stress-designed by the vendors.

16 So, we would need to confirm basically how this relates
17 to the piping and the components.

18 I think what Jim and Tanaka-san were going
19 to discuss next was basically the open path to the RWSP
20 in this case. So, I will let you guys --

21 DR. CURRY: No, I will let you do it.

22 MR. KIPPER: Oh, okay.

23 (Laughter.)

24 DR. CURRY: Please.

25 MR. KIPPER: What we do have with the RHR

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1 system is, during power operation, it is aligned to
2 perform containment spray. So, basically, the suction
3 of the piping system is open to the RWSP. In this case,
4 during power operation if we did have a failure of the
5 reactor coolant pressure boundary isolation valves on
6 the RHR, we would essentially be just -- we would have
7 an open-flow path to the RWSP to basically collect the
8 intersystem LOCA water. And then, we could use our
9 safety injection pumps or charging pumps to basically
10 recover RCS at the torque.

11 MEMBER REMPE: On your ability to maintain
12 RCS -- are we done with this question, John, or did you
13 have another follow-on? Okay. I have a different
14 question then.

15 On the seals on the pumps, they always talk
16 about engineering judgment like on page 46 of your Design
17 Certification Document for Chapter 19 that was used to
18 assume that they could last for one hour. Is there any
19 data? Were sensitivities done or anything? Or you
20 assumed one hour?

21 DR. CURRY: Chapter 19 took input from
22 another chapter on that. I want to say that one hour
23 doesn't -- 19 uses one hour that identified in another
24 chapter.

25 MEMBER REMPE: But there is a basis for it

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1 somewhere else that you can find, besides engineering
2 judgment?

3 DR. CURRY: Yes.

4 DR. TANAKA: Yes, there is a basis. There
5 is a calculation done --

6 MR. HAMAMOTO: Yes, this is Hiroshi
7 Hamamoto.

8 That would be based characterization.
9 Reading that one lower, the same temperature, does not
10 exceed the design temperature. The temperature is 130
11 degrees Fahrenheit, because to first see if the coolant,
12 see the temperature is the room temperature, around 50
13 or 60 degrees Fahrenheit.

14 The seal coating, also, it was seawater
15 reactor system high temperature water up to the sealed
16 portion. And the sealed portion temperature is
17 included, but that time is a long time. Before one hour,
18 the seal portion's temperature does not include that
19 second seal reactor coolant pumps to come to seal design
20 temperature.

21 DR. CURRY: Hamamoto-san, is that testing
22 or calculation?

23 MR. HAMAMOTO: No, that is a calculation.

24 DR. TANAKA: Yes, and we provided that
25 calculation as an RAI response. It is a calculation

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1 based on how long it will take for the sealed assembly
2 to heat up to the design temperature. And we have the
3 response. The RAI response is a calculation, and we
4 show that for one hour it does not reach the design
5 temperature.

6 MEMBER REMPE: Okay. So, I would like to
7 see a copy of that, if it is possible, please.

8 CHAIRMAN STETKAR: Don't look at me. I can
9 tell you, I am not the staff.

10 (Laughter.)

11 MEMBER REMPE: But you are the enforcer,
12 John.

13 (Laughter.)

14 Okay.

15 CHAIRMAN STETKAR: We have raised that
16 question in a couple of other Subcommittee meetings
17 also, I know, about the survivability for an hour.

18 MEMBER REMPE: For this particular design?
19 Because I didn't remember it. Indeed, I wasn't here.

20 CHAIRMAN STETKAR: For this particular --

21 MEMBER REMPE: Okay.

22 CHAIRMAN STETKAR: Yes. And I went back
23 and looked, and the last notes I had was it was still
24 in the process of review. So, it sounds like it may
25 have moved since then.

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1 MEMBER REMPE: Okay.

2 CHAIRMAN STETKAR: So, we should try to see
3 that, if that is the case.

4 MEMBER REMPE: So, sensitivities, even if
5 it is an analysis of the effects on what happens, if
6 it is longer or shorter, might be worthwhile. And I
7 didn't see that done.

8 CHAIRMAN STETKAR: There is a different
9 question that I had related to the seals. And that is,
10 there are statements that seem to be made that said,
11 well, you know, we have much better seals than
12 Westinghouse, and they can, indeed, survive, maybe they
13 can survive without any LOCA, but we are going to assume
14 that they fail because that is conservative.

15 Of course, that assumption makes things
16 like station blackout look bad, for loss of all component
17 cooling water look bad, those two being the largest
18 single initiating-event contributors to my risk
19 profile.

20 If, indeed, the design-specific seals can
21 resist loss of all coolant, no seal injection and no
22 thermal barrier cooling, for a long time, hours and hours
23 and hours, without significant increase in seal weep-off
24 flow, if that, indeed, is the claim from the designer's
25 perspective, then why doesn't the risk analysis model

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1 that design? And that would substantially change the
2 entire risk profile of this plant.

3 MR. SPRENGEL: I think, right now we do
4 understand that we have a conservative model being used
5 for RCP seal failure. And we also have additional
6 testing being performed now on the RCP seals themselves.

7 That is one of the reports that was mentioned by Hossein
8 earlier going in the end of February.

9 CHAIRMAN STETKAR: Okay.

10 MR. SPRENGEL: So, one of them is the
11 Fukushima Technical Report, and the other one is the
12 RCP seal performance. So, we have that testing ongoing
13 now, and the report will be coming in the end of this
14 month.

15 Along with those submittals, we will do an
16 evaluation of how different assumptions for RCP seal
17 performance would affect the PRA. We do not intend to
18 change the model because determining what the new model
19 should be would be very challenging. So, we do intend
20 to look at the impacts, like a sensitivity analysis,
21 to determine what impacts there would be on the PRA.

22 But we do not have a plan right now to change the model
23 itself.

24 CHAIRMAN STETKAR: See, this is what really
25 bothers me a bit. If, indeed, the US-APWR design is

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1 extremely resistant to reactor coolant pump seal LOCAs,
2 as the testing program may confirm, that feature is a
3 very important feature of the design and it would
4 substantially affect not only the overall core damage
5 frequency, which I admit from this particular issue is
6 evaluated conservatively -- so, in terms of, is my core
7 damage frequency 10 to the minus 2 or 10 to the minus
8 10, it conservatively estimates it within that range.

9 But it would also substantially change the risk
10 profile.

11 The relative importance of component
12 cooling, the relative importance of station blackout,
13 the relative importance of any of those scenarios
14 involved in seal LOCA would change substantially; other
15 things would raise. The overall level would go down.

16 Different rocks would come up and poke their head above
17 the surface. In that sense, getting a Risk Achievement
18 Worth of 2 to a much lower overall core damage frequency
19 from something that is not modeled might appear. It
20 could change your overall conclusions about what is the
21 population of equipment on that D-RAP list that the
22 licensee eventually will need to pay attention to.

23 MR. SPRENGEL: And that is the reason why
24 we are doing the evaluation. So, we do agree with what
25 you are saying --

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1 CHAIRMAN STETKAR: But you said you are not
2 going to change PRA.

3 MR. SPRENGEL: That is correct. That is
4 correct. And it goes back to one of your points earlier
5 of what your viewpoint of the current PRA is versus what
6 its application is.

7 So, when we evaluate the application of the
8 PRA now for the certification, we are looking at the
9 use of it and the detail put into the PRA right now,
10 and what amounts of impact we have. So, we are going
11 to confirm the level of impact. And I do agree, if there
12 was an enormous amount of impact from the model change,
13 it would need to be put in place.

14 CHAIRMAN STETKAR: Okay.

15 MR. SPRENGEL: And that will be part of our
16 evaluation --

17 CHAIRMAN STETKAR: Okay.

18 MR. SPRENGEL: -- to confirm that the
19 impact is not so large that it basically invalidates
20 the current --

21 CHAIRMAN STETKAR: I am glad to hear what
22 you just said because the problem is, if it could make
23 a large impact, then it would make the task assigned
24 to that Expert Panel extremely difficult because they
25 would, then, need to think about what would the risk

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1 profile be with that improved design, and then, what
2 might be important. And that is really, really
3 difficult to ask a human being to sort of consider.
4 So, I am glad to hear that, if it does make a big
5 difference, you will get the model --

6 MEMBER REMPE: Maybe I am asking the
7 obvious, but you said for the application design
8 certification you would rather not change the PRA, if
9 you don't have to. But, in light of all the discussion
10 here today, if the purpose of the upgraded PRA is to
11 support technical specifications, there is some sort
12 of intent from MHI to significantly change the PRA and
13 make it more robust, consider different things?

14 I mean, we have heard this a lot. That was
15 a question I wanted to ask after John had his last
16 discussion about omitting certain components. And is
17 there an acknowledgment on MHI's part that perhaps
18 something that is more complete will be needed if you
19 are going to use this for tech specs?

20 DR. TANAKA: Yes, for the rights and for
21 applications like tech specs, we have all reviewed, and
22 they will be updated or upgraded, as necessary. But
23 we are talking about DCD PRA?

24 MEMBER REMPE: Yes.

25 DR. TANAKA: This, we do not plan to change

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1 the model unless it has huge impacts on the risk
2 insights.

3 MR. SPRENGEL: But, separate from the
4 model, I do want to acknowledge your question. The PRA
5 will be upgraded for plant operation.

6 MEMBER REMPE: Okay. Because maybe it is
7 an obvious question, but I have heard a lot of discussion
8 here today. And I just had to ask.

9 CHAIRMAN STETKAR: Yes, but it will be
10 upgraded not -- I won't use company names -- it won't
11 be upgraded to support the design certification or the
12 combined license. It will be upgraded at some later
13 date by --

14 MEMBER SHACK: Well, it has to be Category
15 2 for the risk-informed tech specs.

16 CHAIRMAN STETKAR: That's right. That's
17 right.

18 MEMBER SHACK: Whenever that --

19 CHAIRMAN STETKAR: Whenever that -- but we
20 will never see that upgraded PRA. We, the ACRS, will
21 never see the upgraded PRA.

22 MR. SPRENGEL: Correct. You will see a
23 revised PRA. There is a revision coming.

24 CHAIRMAN STETKAR: Sure, sure.

25 MR. SPRENGEL: But you will not see the

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1 upgraded --

2 CHAIRMAN STETKAR: The upgraded PRA,
3 because that thing will be done post-COL --

4 MR. SPRENGEL: Yes.

5 CHAIRMAN STETKAR: -- for whatever
6 application-specific --

7 MEMBER BLEY: Unless it comes up under an
8 application.

9 CHAIRMAN STETKAR: Yes, but we typically
10 don't see those. We can ask them.

11 MR. SPRENGEL: We don't have a plan for you
12 to see them.

13 (Laughter.)

14 CHAIRMAN STETKAR: Right. We understand
15 that.

16 And you said end of February, Ryan, that
17 report is going to be submitted to the staff on the seal
18 testing?

19 MR. SPRENGEL: Yes.

20 CHAIRMAN STETKAR: Okay.

21 DR. CURRY: Okay. I would propose moving
22 to the next slide, which is --

23 MEMBER BLEY: Well, before you move, just
24 let me ask you a question --

25 DR. CURRY: Yes, sir.

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1 MEMBER BLEY: -- because I have got to think
2 some more about this. Is everything about the
3 interfacing LOCA given in that page-and-a-half in
4 Chapter 2 or is there more information somewhere else
5 in the PRA? Oh, I am not talking Chapter 9 now. I am
6 talking the PRA.

7 All I found about interfacing LOCA was a
8 little over a page of kind of back-of-the-envelope calcs
9 to dismiss it. Is that the extent?

10 DR. CURRY: So, are you talking about the
11 PRA?

12 MEMBER BLEY: Yes.

13 DR. CURRY: The PRA itself?

14 MEMBER BLEY: Rev. 3 of the PRA.

15 DR. CURRY: I would say Rev. 3 of the PRA
16 is a summary of -- you know, it is the PRA.

17 MEMBER BLEY: But that's it; it is just that
18 one page? There is nothing hidden off in some other
19 systems analysis or somewhere that tells me more than
20 that?

21 DR. CURRY: One of the other 14,000 pages?

22 MEMBER BLEY: Well, under "Initiating
23 Events," it says --

24 DR. CURRY: Right.

25 MEMBER BLEY: -- can't happen; here's a

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1 little back-of-the-envelope calculation to convince
2 you.

3 CHAIRMAN STETKAR: That is the only one I
4 could find, was in that "Initiating Event" section.

5 MEMBER BLEY: That's it?

6 DR. TANAKA: DCD, yes, is a short summary.

7 MEMBER BLEY: I need to look at that some
8 more. Okay. I mean, when I get to the end, it says
9 10 to the minus 12 per year is a very conservative
10 calculation. I want to think about that some more.

11 (Laughter.)

12 DR. CURRY: All right?

13 MEMBER BLEY: Go ahead.

14 DR. CURRY: Okay. US-APWR special design
15 features to reduce the large release frequency. We
16 talked a little bit this morning about the igniter
17 system. So, in the course of developments and
18 discussions with the staff, a battery-powered hydrogen
19 ignition system is a design change that has been made.

20 Reliable reactor cavity flooding features
21 the reactor cavity geometry. And if you have the DCD,
22 some of this may be illustrated more easily in Figure
23 19.2-1. It is a good summary of these issues.

24 MEMBER BLEY: Say that again, 19 --

25 DR. CURRY: Figure, yes, 19.2-1.

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1 MEMBER REMPE: Page 1324.

2 DR. CURRY: Reactor cavity geometry, so in
3 terms of the depth and the spreadability of a core EM,
4 a diverse RCS-to-pressurization line, in addition to
5 the safety depressurization valves. Geometry to limit
6 direct containment heating and DCH event; basically,
7 a core debris trap. Alternate method of containment
8 cooling using component cooling water in the fans, and
9 the ability to eject core water to the cavity in the
10 spray header. So, all of those features act to limit
11 the containment failure modes and help protect the tank.

12 MEMBER REMPE: But, before you go on -- in
13 fact, if you could bring up this figure on page 1324,
14 it would be great. But, first of all, regularly, you
15 and the staff refer to the fact that you can assure
16 ex-vessel cooling, but then you say, "We are not taking
17 credit for it because there is so much uncertainty,"
18 right?

19 DR. CURRY: That's right.

20 MEMBER REMPE: So, even though you have got
21 those words there, you can't count on it.

22 But the other thing, though, is that I look
23 at this figure, and even at the beginning of the DCD
24 or the PRA, it shows a vessel that just snugly fits
25 inside some structure there. If you had tried to take

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1 credit for internal reactor vessel cooling, there would
2 have been a lot of questions about the insulation around
3 the vessel, the gap between the vessel and the cavity,
4 and the ability to relieve steam that is generated.

5 So, even though you are not taking credit
6 for it, how do I know -- and again, I apologize; maybe
7 there are some documents where I missed some better
8 pictures of this vessel. It is stuck in the structures.

9 You are going to have a path for the steam
10 to leave, and you are not going to have any
11 pressurization occurring in that area. Has someone
12 evaluated that somewhere?

13 DR. CURRY: Goda-san, would you like to
14 respond to this question, please?

15 MR. GODA: Okay. I am Hiroshi Goda, an
16 accident analyst.

17 We performed mock evolution in containment
18 performance behavior, and then, we have more developed
19 inside of containment suddenly, including a pathway
20 between the reactor cavity and the compartment that
21 connected that cavity upward. We identified there is
22 not much pressurization inside the reactor cavity after
23 melt-through. So, we believe that there is a sufficient
24 to release now steam from the reactor cavity to other
25 compartment inside containment.

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1 MEMBER REMPE: Is there insulation around
2 your vessel?

3 MR. GODA: Yes.

4 MEMBER REMPE: And did you model that
5 structure of --

6 MR. GODA: Well, in truth, by itself, it
7 is not modeled. It is not modeled, but we identified
8 that gap between the reactor vessel and, also, that
9 cavity wall.

10 MEMBER REMPE: And how big is the gap?

11 MR. GODA: It is very narrow, like 200
12 millimeters, like 8, 10, 8 inches. But not just in the
13 gap, but, also, we have entered the pathway to release
14 generated steam.

15 MEMBER REMPE: Where is the other pathway?

16 I am looking at the picture, and I thought that -- oh,
17 it is this little kind of curve over on the other side?

18 MR. GODA: Yes, that's right. That's
19 right.

20 MEMBER REMPE: Okay. What about the fact
21 that you didn't include the insulation, and other
22 industrial retention evaluations that concerned the
23 insulation could adversely affect what is going on down
24 there when you have got water and chugging from steam
25 being generated, and that it would fall against the

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1 vessel? And there was a lot of concern that there might
2 be some adverse consequences from it.

3 MR. GODA: We do not consider any kind of
4 external vessel cooling for the core. So, related to
5 industrial retention or any kind of cooling, we do not
6 model.

7 MEMBER REMPE: Right, but you are going to
8 have to relieve steam, and you are going to have a lot
9 of junk down there from insulation that is probably going
10 to fall all off.

11 MR. GODA: That's right. That is why I say
12 we have the pathway.

13 MEMBER REMPE: The alternative pathway?

14 MR. GODA: That's right. That's right.

15 MEMBER REMPE: Okay. And you did consider
16 that, and it helped you alleviate any sort of
17 pressurization?

18 MR. GODA: Yes.

19 MEMBER REMPE: What about this ledge? I
20 guess that when you talk about that you have limited
21 the debris going up into the containment, if I look at
22 this picture again, the one thing, I don't think I have
23 seen another plant designed with this ledge that kind
24 of sticks out on the -- it would be nice if I could look
25 at the picture, but you have, I believe you call it the

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1 core debris trap. And I think it is this ledge thing
2 that sticks out.

3 Is there any experience on what the effect
4 is? I assume you have limited the debris going up in
5 the containment because of just the structures and
6 barriers and the debris, but what is the role of that
7 ledge?

8 MR. GODA: Well, actually, experiment, any
9 kind of a trend we do not perform. But as long as our
10 research, our literature review performs for the Zion
11 plant for DCH, and the Zion does not have that kind of
12 area to trap the core debris after the entrainment, the
13 entrained debris, and then, comparing to the Zion
14 geometry and, also, the US-APWR geometry, then,
15 qualitatively, we expect that debris dispersion is less
16 than the Zion.

17 MEMBER REMPE: I just haven't seen it
18 before. It might be a little bit less, but I am
19 surprised.

20 MEMBER BLEY: Do you mean that little hook
21 where you go around?

22 MEMBER REMPE: Yes, I have never seen a hook
23 like that before. So, again, if you had a lot of junk
24 coming down, would it catch on that hook and --

25 MEMBER BLEY: No, there is a big hole right

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1 next to the hook.

2 MEMBER REMPE: Well, not much, but would
3 it cause a lot of stuff to pile up higher than normal,
4 is what I am kind of wondering.

5 MR. GODA: I'm sorry?

6 MEMBER REMPE: Well, that hook, could it
7 cause debris to pile up underneath, is what I am
8 wondering, so you would have -- you know, melt spreading
9 is an important thing. Everybody wants it to spread
10 out after it falls out of the vessel. And you have got
11 a hook there that particulates and junk would come out.
12 And would it cause things to pile? I was wondering
13 if you had done some experiments.

14 I know that for the Zion geometry they did
15 do a lot of experiments trying to look at entrainment.

16 MR. GODA: Not experiments, nothing, no
17 experiments, no.

18 MEMBER REMPE: I was just curious.

19 CHAIRMAN STETKAR: Are you okay, Joy?

20 MEMBER REMPE: I'm done now. Thank you.

21 CHAIRMAN STETKAR: Jim, on this slide -- we
22 are slowing down, but we expected to do that -- a couple
23 of questions on this slide. The fourth bullet, the
24 diverse RCS depressurization valves, the DVs, why are
25 those valves not included in the model for

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1 bleed-and-feed cooling?

2 DR. CURRY: These are the severe accident
3 slides.

4 CHAIRMAN STETKAR: There are valves. Why
5 are those valves not included in the model for
6 feed-and-bleed cooling?

7 DR. TANAKA: To make clear the question,
8 we take credit for a different valve, safety
9 depressurization valve, but we don't take credit for
10 this one.

11 CHAIRMAN STETKAR: I know what is in the
12 model. I am asking why those valves are not included
13 in the model for feed-and-bleed cooling. If I am an
14 operator and I try to open valve No. 1, and it doesn't
15 open, and I try to open valve No. 2, and it doesn't open,
16 and I see I have these other valves over here that I
17 can open, I am going to sit there and say, okay, I'll
18 melt the core because the PRA guys only took credit for
19 those as severe accident mitigation valves.

20 (Laughter.)

21 The reason that I am being so flip about
22 this is that it is a vent path, a release path for the
23 containment, the same way that the SDVs through the
24 pressurization relief tank are a release path for the
25 containment, dumping heat eventually into the RWSP.

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1 If you took credit for those valves for feed-and-bleed
2 cooling, you would have a lower frequency of core damage
3 scenarios. Those valves would be guaranteed failed
4 once you got out to your Level 2 models. So, Level 2
5 wouldn't make any difference because you still need
6 failures of all three sets of valves. But you would
7 never have the core damage that got to Level 2.

8 So, the question is, why don't you include
9 credit for those valves for feed-and-bleed cooling to
10 prevent core damage? Because the same consequential
11 failures after you open those valves in terms of CS RHR,
12 alternate containment heat removal, and whatever, would
13 apply regardless of however I am dumping the energy back
14 in there.

15 DR. CURRY: Just to rephrase your question,
16 it is just another way of depressurizing the system,
17 which is important to us. So, I don't know whether that
18 was --

19 CHAIRMAN STETKAR: And, in fact, it is a
20 larger flow path. So, it would be even more efficient
21 than the SDVs.

22 MEMBER BLEY: It makes me wonder if there
23 was a linkage to the development of emergency
24 procedures. Would opening these be in the procedures
25 or would just the ones you modeled be in the procedures?

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1 CHAIRMAN STETKAR: They don't have the
2 procedures.

3 MEMBER BLEY: Well, they don't have the
4 US-APWR procedures complete, right? We have heard you
5 have got some, right?

6 MR. GODA: Excuse me. We have the
7 procedure. However, we have not opened it to the NRC
8 yet. In the procedure, we do have the process to open
9 all the valves.

10 MEMBER BLEY: All the valves?

11 MR. GODA: Fifty percent of them involved.
12 If that fails, then depressurization is involved for
13 a severe accident. In the PRA, no, not these are an
14 assumption in the PRA because we say that a severe
15 accident is mitigated. So, that is why we wanted to
16 model. SDV is for design basis. If it is failing the
17 design basis, then we have analog redundant diversity
18 ready for severe accident.

19 Just we wanted to model it in that way.
20 And also, we wanted to consider a defense-in-depth
21 concept. Because the safety depressurization is
22 involved, that is provided to mitigate the design basis.

23 So, the accident dedicated? It sounds to me it is not
24 dedicated for the accident. So, we model as it is, not
25 these other assumptions. However, for the actual

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1 procedure, that is not right.

2 MEMBER REMPE: Do they have a positive
3 indication that the valves have opened in the control
4 room? You have positive indication in the control room
5 the position of these valves all the time?

6 MR. GODA: Yes. Yes.

7 MEMBER REMPE: And there is some way of
8 determining if they are --

9 CHAIRMAN STETKAR: They are
10 motor-operated --

11 MR. GODA: Yes.

12 CHAIRMAN STETKAR: -- safety-related
13 valves.

14 MR. GODA: That's right.

15 DR. TANAKA: And also, I would like to add
16 that, for the feed-and-bleed operation or failure of
17 feed-and-bleed is mostly dominated by human operator
18 action error. So, even if this valve is credited, I
19 do not believe it will change the risk profile
20 significantly.

21 CHAIRMAN STETKAR: I mean, I don't know
22 what else to say. You are not modeling the actual design
23 of the plant, and you are not modeling the design
24 consistent with what we just heard in your operating
25 procedures.

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1 And I don't like excuses that say, well,
2 this thing is more important, has a higher failure rate
3 than this thing, so we don't need to model this. That
4 is just an excuse.

5 Alternate containment cooling, that
6 function, that is an interesting function. Do you have
7 any slides on it? Were you going to address that? Or
8 is this the place to talk about it?

9 DR. CURRY: Well, I would say this is the
10 place to talk about it.

11 CHAIRMAN STETKAR: This is? For a while
12 when I was looking at the model, because it is always
13 characterized as the fan coolers, and I always think
14 of a fan cooler as a fan and a cooler. It is not really
15 the fan cooler. It is only the cooling coils for the
16 fans with convective heat transfer from the RWSP up to
17 those cooling coils, and component cooling water flow
18 through those cooling coils.

19 I looked at whatever it is, Appendix 5A,
20 or whatever, in the PRA report where there are some math
21 calculations to show that that works. Now I will ask
22 the staff on this. I have never seen anybody take credit
23 for that. I am not a thermal hydraulics person. I don't
24 know, Joy, whether you looked at it.

25 Every plant I have seen said you need forced

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1 airflow across the surfaces of those cooling coils to
2 get effective heat transfer. I don't know what the fan
3 cooler geometry looks like. I have seen several that
4 have shrouds around them, so that you make sure you get
5 active flow across the cooling coils. They are not just
6 open, hanging out in the containment by themselves,
7 which would imply that this natural convective flow
8 needs to come up through the fan itself and get past
9 the fan blades into the cooling coils.

10 How carefully have you looked at that
11 passive convective heat transfer process within the
12 containment? Because it is in all of the models. It
13 is your ultimate way of saving the core and the
14 containment in all of your event sequence models. So,
15 it could be -- numerically, I didn't pay much attention
16 to how much your Risk Achievement Worth is, but, in
17 principle, it could be very, very important.

18 MEMBER SCHULTZ: If it is functional.

19 CHAIRMAN STETKAR: If it is can actually
20 work.

21 DR. CURRY: Goda-san.

22 MR. GODA: Okay. We have discussed about
23 the mechanism, how the natural convection works, through
24 the RAI. And the NRC staff requested to explain the
25 mechanism. I do not remember that number, but we have

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1 answered about that.

2 We performed by experiment how the coil
3 cooling works. And then, we plotted, sometimes
4 including efficiency, and then, we modeled that result
5 into a math variation model. And then, we evaluated
6 the coolability.

7 CHAIRMAN STETKAR: Okay. And you said
8 that analysis and the experiment has been submitted to
9 the staff?

10 MR. GODA: Yes.

11 CHAIRMAN STETKAR: Okay. Okay. I will
12 ask the staff about that. Thank you.

13 Joy, did you look at that at all?

14 MEMBER REMPE: No, I didn't, but I am not
15 aware of any other analysis that has been done to look
16 at that in other places.

17 CHAIRMAN STETKAR: Or experiments. I
18 don't know where the fan coolers are physically located,
19 you know, geometrically located.

20 Okay, yes, that is a cartoon. They are on
21 Bill's screen over here.

22 (Laughter.)

23 They tend to be fairly high up in the
24 containment. They tend to be around the edges usually
25 in most plants. But I don't know this plant.

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1 And they said that, basically, putting
2 component cooling water flow through two, and only two,
3 of them provides sufficient heat transfer to remove
4 decay heat, basically.

5 MEMBER REMPE: Steve, did you say you were
6 aware of other analyses for other plants that have been
7 done?

8 MEMBER SCHULTZ: No, I was interested in
9 this analysis because I am not aware of other --

10 CHAIRMAN STETKAR: I have seen a lot of
11 plants who have said they have forced convection flow,
12 you know, that they look at the normal heat removal
13 capacities with forced flow across them. And some of
14 the make it and some of them don't, depending on how
15 big the fan coolers are. But I have never seen one like
16 this. And because I can't boil water, I can't
17 independently sense whether or not this is reasonable.
18 So, we will ask the staff when they come up and see where
19 that stands.

20 DR. CURRY: All right. Moving on, Mr.
21 Chairman?

22 CHAIRMAN STETKAR: Yes, sir.

23 DR. CURRY: I think you discussed this
24 morning standard data sources and you did mention that
25 we used generic data, and that is true in a number of

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1 cases. So, you will probably recognize some of these
2 references.

3 CHAIRMAN STETKAR: Yes. Are you going to
4 talk about initiating-event frequencies or is this the
5 place to ask about those?

6 DR. CURRY: I think you should ask about
7 them here.

8 CHAIRMAN STETKAR: Okay. Loss of
9 component cooling water or loss of central service
10 water, you have lumped the two symptoms together. You
11 have two initiating events, one that is total loss of
12 component cooling water, LOCCW, and one that is partial
13 loss of component cooling water, PLOCW.

14 You developed a fault tree model to quantify
15 the frequency of LOCCW. And in fact, that practice is
16 what is generally recommended for any type of support
17 system failure because, generically, they just pretty
18 much don't apply.

19 Let me ask first about why did you use
20 generic data from U.S. nuclear power plants to quantify
21 the frequency for partial loss of component cooling
22 water when you felt it necessary to rely on a
23 plant-specific fault tree analysis to quantify the
24 frequency of total loss of component cooling water?
25 I don't understand philosophically why you did that.

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1 So, could you explain that? Because you
2 did use from NUREG/CR-6928 exactly the frequency
3 for -- you added together loss of ESW and loss of CCW
4 for the partial.

5 DR. CURRY: Please answer.

6 MR. NIRASAWA: US-APWR has two separate
7 systems, one in B and C and D. And this is the same
8 feature over US-APWR component screening water system.

9 So, credits initiating-event frequency of the total
10 or also with the CCW event. We performed the fault tree
11 analysis.

12 CHAIRMAN STETKAR: Yes, I know that. I am
13 asking, because you did that -- and I understand why
14 you did that -- why did you use the generic frequency
15 from U.S. nuclear power plant operating experience for
16 partial loss of component cooling water?

17 DR. CURRY: Just to repeat, the fault tree
18 for the complete loss of component cooling water, but
19 data for the partial loss, is that your question?

20 CHAIRMAN STETKAR: Uh-hum.

21 DR. CURRY: Do you recall --

22 CHAIRMAN STETKAR: If U.S. data for total
23 loss of component cooling water don't apply because of
24 the design-specific configuration, normal lot, number
25 of operating trains, and because you have lumped

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1 together essential service water and component cooling
2 water, I understand that. Then, why do generic data
3 from U.S. plants apply for partial?

4 DR. CURRY: For the partial loss?

5 CHAIRMAN STETKAR: It just doesn't seem to
6 be logically consistent.

7 DR. CURRY: Right. Could we take that
8 maybe as a homework assignment?

9 CHAIRMAN STETKAR: That would be great.

10 (Laughter.)

11 I mean, the more of these questions that
12 you can answer that way, the better we will keep things
13 moving along.

14 DR. CURRY: All right.

15 CHAIRMAN STETKAR: Let me ask you one
16 thing, because CCF also appears on this slide, and I
17 brought it up. That total loss of component cooling
18 water initiating-event frequency is quantified through
19 a fault tree. And in that fault tree, you use a component
20 cooling water running common-cause failure parameter
21 that is effectively $1E$ to the minus 4. Now it is
22 calculated by a beta times a gamma. So, it is calculated
23 by a 10 to the minus 3 times a $.1$. But the way it is
24 implemented is the common-cause failure parameter for
25 failure of all four running component cooling-water

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1 pumps or all four running essential service water pumps
2 is 10 to the minus 4. That common-cause failure
3 parameter is not derived from NUREG/CR-5497. In fact,
4 it is derived from one -- and I will not mention his
5 name; he is listed in the references -- one value
6 provided by one consultant.

7 Now I submit that total loss of component
8 cooling water and the component cooling water system
9 are some of the more risk-important results in your PRA
10 right now. It is difficult for me to understand why,
11 when you use generic data from all of these sources,
12 that when you come to that one particular parameter,
13 you rely on an estimate from one person, especially
14 because in NUREG/CR-5497 the experts who looked at the
15 actual common-cause failure data that were used to
16 support that report in principle -- now I didn't
17 participate, so I don't know what they really did -- but,
18 in principle, they looked at each event and said, would
19 this event apply to a population of two, and only two,
20 components; three, and only three, components; four or
21 more components?

22 So, they developed what they called the
23 impact vectors to say there is some probability that
24 this particular event would, indeed, apply to four
25 components. That is how they derived for the most part

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1 many of their conditional values for delta and gamma
2 in that, because many, many times they only had failures
3 of two.

4 So, if they went through that process and
5 derived a gamma factor and a delta factor for failures
6 of running component cooling water pumps, why do those
7 values not apply to a plant design that has four pumps?

8 Why do you need to use values that are a factor of,
9 oh, 100 times lower? They are not quite 100. I think
10 it is 60. I exaggerate sometimes.

11 I have a real question about that. I know
12 the staff raised a question about it also. But when
13 you talk about all of these sources of data, it is not
14 quite as clean as what appears on your slide here.

15 DR. CURRY: That's right. Basically, just
16 the major sources.

17 Okay. So, just to repeat your question,
18 the common-cause failure probability of the CCW, 1E to
19 the minus 4, we used a specific reference which, you
20 know, you are really questioning why did we use that
21 reference as opposed to applying a methodology --

22 CHAIRMAN STETKAR: And as best as I can
23 tell, it wasn't an expert elicitation. It was a value
24 provided by one, and only one, individual. That is the
25 way it is referred to in the report. Because it is in

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1 the proprietary report, and I don't necessarily want
2 to point fingers at individuals -- it is in the PRA report
3 in the initiating-event, I believe, analysis section.

4 And that is why I didn't want to mention the individual
5 or the specific reference.

6 DR. CURRY: Well, we appreciate that. Do
7 you have, just to make it easy for our assignment, do
8 you have that particular page number or something
9 that --

10 CHAIRMAN STETKAR: Somewhere I do. It is
11 in this pile here somewhere. I will give it to you
12 offline later.

13 DR. CURRY: Okay. Yes, we appreciate it.

14 CHAIRMAN STETKAR: You can go on, if you
15 are ready. I am just writing notes here.

16 DR. CURRY: All right. This slide is just
17 a summary of the PRA methods and codes which you are
18 familiar with, based on the prior discussions. So, that
19 was all that was intended by this slide.

20 MEMBER REMPE: Before you leave it,
21 though -- and again, this could be me -- but I couldn't
22 find it in the almost 200 pages or files in the PRA.

23 But when I look at File 110, which is Chapter 14 of
24 the PRA, I don't see anywhere that you present a
25 comparison between WCOBRA and MAAP to give me confidence

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1 that the MAAP model is consistent with the thermal
2 hydraulics behavior. Is there some other file
3 somewhere that I have missed that I should have looked
4 for?

5 DR. CURRY: Maybe we should clarify what
6 did we use MAAP for, what did we use the WCOBRA for.
7 And then, your question is, did we --

8 MEMBER REMPE: Well, usually, you use MAAP
9 for severe accidents and WCOBRAs for the design basis.

10 DR. CURRY: Right.

11 MEMBER REMPE: But you typically will do
12 a comparison to say, yes, they are predicting the same
13 pressure when you have a certain size hole. Did you
14 do some sort of comparison showing that? Because that
15 is typically a good idea.

16 (Laughter.)

17 It might be good to do such a comparison.

18 MR. GODA: No.

19 MEMBER REMPE: Okay.

20 MEMBER SHACK: And the staff didn't ask you
21 to do that? That has typically been done.

22 DR. CURRY: Well, just to reaffirm, you
23 know, they were for different purposes.

24 MEMBER SHACK: Right.

25 DR. CURRY: But your thought is it would

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1 still be good to maybe benchmark them?

2 MEMBER SHACK: Yes. I mean, it has been
3 frequently done, to just benchmark the MAAP since --

4 MEMBER SCHULTZ: That would be for a
5 crossover comparison.

6 MEMBER SHACK: Yes.

7 MEMBER REMPE: Right. And it is typically
8 done, and I didn't see it, but there was a lot of stuff
9 to read here. But it sounds like it was not asked if
10 no one has done it from MHI.

11 MR. KHATIB-RABHAR: Can I make a remark?

12 CHAIRMAN STETKAR: Uh-hum.

13 MR. KHATIB-RABHAR: Mohsen Khatib-Rabhar
14 from ERI. We are the contractor to the staff in
15 reviewing things.

16 The question you are asking relates to
17 thermal hydraulics. MAAP generally for severe
18 accidents is compared to MELCORE.

19 MEMBER REMPE: I am asking --

20 MR. KHATIB-RABHAR: And the NRC has done
21 confirmatory calculations to check those. And keep in
22 mind, WCOBRA, it only goes to a certain level. For
23 severe accidents, you go to a core melt situation.

24 MEMBER REMPE: I truly understand that,
25 but, typically, even --

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1 MR. KHATIB-RABHAR: Heat trapped
2 temperature is not --

3 MEMBER SHACK: We are in Level 1 yet.

4 MR. KHATIB-RABHAR: I'm sorry?

5 MEMBER SHACK: We are in Level 1.

6 MR. KHATIB-RABHAR: I understand. I
7 understand you are Level 1, but --

8 MEMBER SHACK: But, then, why are you
9 talking about MELCORE? I mean, all you are going to
10 do is compare success criteria computed with MAAP and
11 with WCOBRA.

12 MR. KHATIB-RABHAR: But the question was
13 asked regarding severe accidents, I think.

14 MEMBER REMPE: No, what I am asking is the
15 depressurization. Just as you have got a hole in the
16 vessel --

17 MR. KHATIB-RABHAR: Sure.

18 MEMBER REMPE: -- and what predicted by
19 WCOBRA versus what is predicted by MAAP, and are they
20 giving consistent values, just like we might compare
21 RELAP to MELCORE at first?

22 MR. KHATIB-RABHAR: Yes.

23 MEMBER REMPE: And I have heard from MHI
24 they did not receive such a request, and they did not
25 do that.

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1 MR. KHATIB-RABHAR: Yes, but for severe,
2 I just want to say for severe accidents, that is not
3 the case. The staff has done confirmatory
4 calculations, and they have actually looked at this
5 issue.

6 MR. FULLER: Excuse me. Can I make a
7 remark?

8 CHAIRMAN STETKAR: Come on up, Ed.

9 MR. FULLER: Thank you.

10 This is Ed Fuller from the Office of
11 Research. I am a Senior Technical Advisor for severe
12 accident phenomena. And I used to be, before I got that
13 position, the technical reviewer for the Level 2 PRA
14 and severe accident evaluation.

15 Now what we are seeing here is MAAP's use
16 for the Level 1 for the success criteria. And we were
17 looking at COBRA for the large break LOCA. Well, then,
18 you get into, whoever has tried to use MAAP for large
19 break LOCA analysis for thermal hydraulics knows that
20 the phenomenology are not modeled properly. And for
21 years, EPRI has told people that is the case.

22 So, I am interpreting this slide to mean
23 that MAAP was used for success criteria for other
24 transients and small break LOCAs, but they didn't use
25 it for the large break LOCA. And perhaps maybe if you

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1 wanted to ask the question of MHI, if that is true, it
2 might be a good idea.

3 (Laughter.)

4 MEMBER REMPE: Is that true? But, again,
5 I would still like to see some comparison for some place,
6 just to see that the model for the MAAP is appropriate.

7 MEMBER SHACK: I mean, I think there is
8 still a question that, even when you are using MAAP for
9 all the other success criteria besides the large break
10 LOCA, it is an approximate thermal hydraulic model.
11 And at least verify with some COBRA track calculations
12 it is giving you reasonable results.

13 MR. GODA: But your question, if we
14 performed the comparison, then my answer is no.

15 MEMBER REMPE: Right.

16 CHAIRMAN STETKAR: You are going to have
17 to help me here or just tell me to be quiet because I
18 can't boil water. Some of the scenarios that are
19 modeled in the PRA include credit for opening the main
20 steam depressurization valves to cool down the secondary
21 side and, thereby, reduce pressure far enough, fast
22 enough, so that you can, indeed, align what I will call
23 low-pressure injections, through containment spray RHR,
24 but essentially get flow, pooling flow into the reactor
25 vessel at low-pressure conditions.

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1 Main steam depressurization valves are
2 relatively small on this plant. Each valve has a rated
3 relief capacity of about a half of percent rated core
4 power, if you do the calcs. The main steam relief valves
5 are pretty big. I can get a good cooldown on the
6 mainstream relief valves.

7 And I was curious how well the thermal
8 hydraulic models do that. The plots, unfortunately,
9 in the PRA model look at 24 hours, and I am kind of
10 interested in, oh, about the first 30 minutes of the
11 event, and everything looks like a vertical line no those
12 plats. So, I couldn't really see rates of cooldown.

13 But it struck me for a core of this power
14 rating it just didn't seem right that opening -- I can't
15 remember right now whether the success criterion is two
16 or three, but it probably doesn't make too much
17 difference -- MSDVs would get you a rapid-enough
18 cooldown for all of the scenarios that include credit
19 for that.

20 Now I don't know, does that seem right or
21 not?

22 MEMBER REMPE: I can't answer that for you.

23 CHAIRMAN STETKAR: Certainly, in the main
24 steam relief valves, they have about 2.5 percent, I
25 think, of rated core power per valve. So, I can get

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1 a healthy cooldown through the relief valves.

2 MEMBER REMPE: Perhaps did the staff verify
3 it with some of the MELCORE runs?

4 CHAIRMAN STETKAR: I don't know. I was
5 going to ask the staff about that.

6 MEMBER REMPE: Yes, because, I mean, that
7 is how I would ask --

8 CHAIRMAN STETKAR: I thought I would ask
9 the folks who did the initial calculation first.

10 DR. CURRY: Well, so, again, just to make
11 sure we are on the same page, you are questioning the
12 modeling of the depressurization, the capacity of the
13 depressurization valves, the modeling?

14 CHAIRMAN STETKAR: Main steam
15 depressurization valves, do they have -- because for
16 anything that is larger than a medium LOCA, that
17 function, if you don't have high-head safety injection,
18 the model includes credit for the operators basically
19 cooling down rapidly on the secondary side, allowing
20 the primary side to depressurize, and I can't remember
21 whether you need active pressure. I think it does open
22 up the SDVs. Get pressure down and, then, inject and
23 go into, you know, essentially, a cooling mode from the
24 RWSP through the heat exchanger, back into the reactor
25 vessel at low-pressure conditions.

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1 And I don't know how rapidly that needs to
2 be initiated. I don't know how quickly the operators
3 need to open those valves, and I don't know whether the
4 thermal hydraulic models treated them -- part of the
5 problem is in some of the documentation I see them
6 incorrectly referred to as main steam relief valves.
7 Although if I look in the fault tree models, they are
8 actually the MSDVs. And I think in the documentation
9 of the thermal hydraulic analyses, they seemed to refer
10 to them mostly as MSDVs, not MSRVs.

11 And I wouldn't question this at all if I
12 had confidence that everything works okay using the
13 MSDVs. But if, for some reason, the thermal hydraulic
14 models looked at the MSRVs, then I know you can get enough
15 cooldown there, but the PRA models are wrong.

16 DR. CURRY: Do you have a reference for us
17 to look at? Because unless we --

18 CHAIRMAN STETKAR: Of the thermal
19 hydraulic analysis? Again, I will give that to you
20 offline.

21 DR. CURRY: That would be helpful.

22 CHAIRMAN STETKAR: I will.

23 DR. CURRY: Unless we are prepared to
24 answer that question now using --

25 CHAIRMAN STETKAR: I will give it to you

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1 as soon as we go offline.

2 DR. CURRY: Okay. Okay.

3 CHAIRMAN STETKAR: Because I have to look
4 it up. I would give it to you now, but I would have
5 to look it up in my files.

6 DR. CURRY: Ready to go on to the next one?

7 MEMBER REMPE: Oh, you bet.

8 (Laughter.)

9 CHAIRMAN STETKAR: Interpret silence as
10 move as fast as you can.

11 (Laughter.)

12 DR. CURRY: I would be happy to.

13 All right. Here is a summary of the PRA
14 results, which here is a numerical summary. And if we
15 prefer to see it on a pie chart, you will see comparable
16 contributions really for the internal events that power
17 internal fire and the flood, also shown here as low-power
18 shutdown contribution.

19 I think I would look also at the LERF number,
20 and you see for low-power shutdown, as we mentioned
21 before, LERF -- sorry, not LERF -- LRF equals CDF.

22 So, the PRA summary that we would say at
23 this point for internal events, the seal LOCA, as we
24 have discussed, is important. We have discussed the
25 one hour and the basis for the one hour.

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1 As you might expect for a four-train system,
2 common-cause failures are important. I sort of jumped
3 to the last bullet.

4 But I should point out that we have no
5 significant common-cause between the Class 1E diesels
6 and the alternate AC diesels -- gas turbine generators.

7 Now, in terms of the important risk insights
8 for a four-train system, support systems are important.

9 The component cooling water is important, as we
10 mentioned, due to seal LOCA impact. And the
11 common-cause failure, due to the high redundancy, is
12 relevant.

13 This is a pie chart which basically shows
14 the major contributors. Loss of offsite power is a
15 significant contributor. Ultimately, the assumption
16 that power is not restored, and we have a seal LOCA leads
17 into a large part for those sequences. Also, a loss
18 of component cooling is also important, again, leading
19 to RCP seal failure.

20 And in those situations, of course, you lose
21 component cooling. You lose the ability to mitigate
22 with injection systems.

23 CHAIRMAN STETKAR: Jim, back up. I am
24 trying to kind of selectively insert some observations
25 that I had when I reviewed the PRA. For example -- and

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1 I am not saying that these are going to be important;
2 I don't believe that they are important overall -- but
3 examples: LODC and LOAC are modest contributors right
4 now. The models for those initiating events assume that
5 for the LOAC event it is Train B and for the LODC event
6 it is Train A of DC. That is what is in the PRA model.

7 There is a discussion about why those are
8 conservative assumptions, B for AC and A for DC.
9 Indeed, they are not conservative. There are more
10 conservative impacts. In fact, the most conservative
11 impacts would be C for AC and D for DC.

12 So, I am curious, you know, when people make
13 decisions about the word "conservative," what type of
14 analysis was done to reach those conclusions? I have
15 examples to tell you why C is more conservative for AC
16 and D is more conservative for DC.

17 I think somebody only looked at emergency
18 feedwater and didn't consider the impacts on the whole
19 plant, is my best guess. So, that is just something
20 for you to look into, if you have some explanation.

21 I read what is there. I understand what
22 I can read.

23 DR. CURRY: Right.

24 CHAIRMAN STETKAR: It is just I don't think
25 it is correct.

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1 DR. CURRY: And just to take it a step
2 further, you conclude that D for the loss of DC power,
3 that train would be more conservative because --

4 CHAIRMAN STETKAR: How much do you want to
5 get into it? It is because it affects several functions
6 in the event tree, as does C for AC. C for AC, for
7 example, takes out a motor-driven emergency feedwater
8 pump, which is correct, which is why it was B, but C
9 also takes out Train C of component cooling water, which
10 affects one-half of your supply for the alternate
11 containment heat removal. B does not affect the
12 alternate containment heat removal because only C and
13 D affect alternate containment heat removal. So, C is
14 worse from that perspective. D, DC power, takes out
15 one charging pump, which is important for seal LOCAs.
16 It takes out D for alternate containment heat removal,
17 and it takes out D, emergency feedwater. It took out
18 A because it takes out A, emergency feedwater. A
19 doesn't affect those other functions.

20 So, what I am trying to understand is, when
21 people make these so-called conservative decisions,
22 what is the basis for them? Now I am not implying that
23 those little, thin wedges are going to become a huge
24 contributor, but it is kind of symptomatic of decisions
25 that are made that are ostensibly conservative, which

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1 in some cases I know are not.

2 And that is why there is a big stack of paper
3 here. There are a lot of examples like that. It is
4 just easy to identify these simple ones here.

5 I don't expect a response back. I will just
6 state that as a fact. They are not conservative. This
7 is not open to debate. They are not conservative.

8 If you had modeled all four of them
9 individually, you would have found that, but you didn't.

10 Now, in the eventual plant-specific PRA, they would
11 need to model all four of them individually because,
12 otherwise, I can't determine the relative importance
13 at that level of detail that I would need for an actual
14 model. But, as long as you are only going to select
15 one, you had better be pretty sure that it, indeed, is
16 the bounding one.

17 DR. CURRY: Okay. I think we understand
18 that comment.

19 MEMBER BLEY: I was just thinking, if they
20 gave you a counter-example why you were wrong, they would
21 have scored a "hat trick" today.

22 (Laughter.)

23 CHAIRMAN STETKAR: Keeping score. As long
24 as it is more than 51 percent correct, I'm happy.

25 (Laughter.)

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1 I don't strive for perfection. I strive
2 for winning.

3 DR. CURRY: Thank you. We have the
4 comment, yes.

5 And also, this is just another breakdown
6 of the relative sequences important to LERF, a large
7 release frequency.

8 Release category summary. In most
9 situations, we have an intact containment with a final
10 containment leakage.

11 The uncertainty results, this just gives
12 you some statistical information. We were talking
13 about mean values earlier. So, this gives you the
14 statistical supporting breakdown.

15 We have discussed with the NRC in several
16 discussions, and this slide just kind of presents it.

17 And I think as the Committee referred to earlier in
18 the day, the documentation of uncertainties is something
19 that you know that we are working on.

20 We have also performed several sensitivity
21 results that are summarized in that Table DCD 19.1-140
22 and added a COL action item to identify and address
23 uncertainties.

24 Key insights and assumptions.

25 CHAIRMAN STETKAR: Not too fast. One

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1 quick question about uncertainty quantification. I
2 didn't see it listed anywhere.

3 I know that in the actual quantification
4 of uncertainty, not the key issues of uncertainty, which
5 is a different subject -- did you, when you quantified
6 uncertainty in risk spectrum, account for the state of
7 knowledge correlation? In other words, you fully
8 correlated all basic events that use the same parameter
9 or did you treat them as independent?

10 There are two options in risk spectrum.
11 You can either correlate the uncertainties or you can
12 treat them as independent. Which one did you use?

13 You might want to take that away and look
14 it up tonight.

15 DR. CURRY: Yes.

16 CHAIRMAN STETKAR: Because it is a detail.

17 It is just that, as long as you are only quantifying
18 parametric uncertainties, especially for a
19 highly-redundant four train, X-to-the-fourth-type
20 correlated uncertainties can occasionally show up.
21 They are not going to dominant common-cause failures
22 and the other things, but it is just a question about
23 the method that you used to actually generate those
24 uncertainty results, because the option is there in risk
25 spectrum.

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1 DR. CURRY: Yes.

2 CHAIRMAN STETKAR: It isn't something that
3 you have to play with.

4 DR. CURRY: So, I think that is all we had
5 intended to say about the at-power PRA, and I have got
6 a summary of the fire PRA, if the Committee would like
7 to proceed.

8 CHAIRMAN STETKAR: I am going to try to be
9 more self-restraining. So, I think if you can hit some
10 of the highlights of the fire PRA, that would be helpful.

11 For planning, if we run until 5:30, will
12 that create problems for anyone? Staff? I understand
13 that we are going to lose bodies. Our recorder, are
14 you okay? Okay.

15 So, let's plan on running until 5:30, and
16 if you can get through the fire and some of the low-power
17 shutdown, that would help.

18 DR. CURRY: Okay. We have fire, flood, and
19 low-power shutdowns.

20 CHAIRMAN STETKAR: Good.

21 DR. CURRY: So, let's go through the fire.
22 Fire, again, the methodology is the methodology
23 outlined in that NUREG. A key point is the four safety
24 trains are separated by a fire barrier. We talked about
25 the turbine building earlier and the electrical rooms

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1 being separated by qualified fire barriers as a risk
2 insight to avoid loss of offsite power.

3 Here is a key assumption: no credit is
4 taken for fire detection and suppression in an area.

5 The yard fire and the turbine milling fire
6 are the largest contributors to risk due to other
7 features, making fire less important in other areas.

8 The yard fire causes a loss of offsite power
9 and ultimate damage, if we have a failure of the Class
10 1Es and ACs.

11 The turbine building fire, the turbine
12 building is divided into one fire area, several
13 compartments that were treated in the PRA and, then,
14 modeled in a transient tree, as appropriate.

15 This is the pie chart kind of summarizing
16 key events, key contributors of the fire risk. I guess
17 the blue one, the FA6-101-01, is a turbine building
18 basement fire, this guy, which causes a spurious -- one
19 of the sequences causes spurious turbine bypass valves
20 to open, which is essentially, you know, it initiates
21 a transient and prevents us from using the steam
22 generators. Therefore, we must depressurize.

23 CHAIRMAN STETKAR: Why do the MSIVs not
24 used? Were the MSIVs modeled for that fire?

25 DR. CURRY: I don't know. The MSIVs, were

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1 they modeled in this?

2 DR. TANAKA: Yes. Which particular event
3 are you talking about?

4 CHAIRMAN STETKAR: Well, the fire, the
5 largest contributor from the turbine building is
6 spurious opening of the turbine bypass valves, which
7 to the plant looks like a steamline break downstream
8 of the MSIVs. Now I was a little bit surprised that
9 it was the biggest fire contributor from the turbine
10 building. And I was curious whether the main steam
11 isolation -- did you use the steamline break downstream
12 of the MSIVs event model, event tree, for that fire?

13 DR. TANAKA: Yes.

14 CHAIRMAN STETKAR: You did? Okay.
15 Because, if that is the case, if that is the biggest
16 contributor from fires, I am really curious why you
17 didn't model stuck-open turbine bypass valves as a
18 similar type of an event in any of your transient models.

19 Steam relief is not modeled in your
20 transient models. One possible thing that can happen
21 is the turbine bypass valves can open, and they can stick
22 open. It has happened at plants. That looks an awful
23 lot like this fire-induced event, except it starts out
24 with a plain vanilla transient, and the valves stick
25 open.

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1 If that type of condition is really
2 important from a fire perspective, I don't know why it
3 might not be important from a transient perspective.

4 So, there may be some details of the fire model that
5 make it worse that I don't understand, and that may very
6 well be the case. But it just seemed really curious
7 when I looked at those results. I wouldn't have
8 expected that to be the case.

9 I will just do that. In the interest of
10 time, we can move on. I will just make that as an
11 observation.

12 DR. CURRY: Okay. The next is just taking
13 the data and dividing things up by LRF frequency and
14 contribution.

15 We go to the uncertainty slide. Again,
16 there is your statistical breakdown. We have been using
17 mean numbers when we talk about these numbers.

18 I think this is kind of similar in terms
19 of discussions with the staff in terms of making our
20 insights and assumptions clear.

21 The transfer to the main control room, to
22 the remote shutdown, console from the main control room
23 was credited in this evaluation.

24 CHAIRMAN STETKAR: Jim, I have to admit I
25 didn't read absolutely everything in the entire PRA.

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1 When you say "the transfer of the remote shutdown
2 console is credited," do you mean that it is modeled
3 or you just assumed that it was successful? In other
4 words --

5 DR. CURRY: The value, yes.

6 CHAIRMAN STETKAR: Did you evaluate the
7 likelihood that the operators would, indeed, abandon
8 the control room with some probability and the features
9 that they can control with the remote shutdown console?
10 Or did you just assume that a fire in the control wasn't
11 a problem because the operators could do all of that
12 other stuff?

13 DR. CURRY: I would somewhere in between
14 there. We have a probabilistic number.

15 DR. TANAKA: Yes.

16 DR. CURRY: And so, what was the basis of
17 the number?

18 DR. TANAKA: Yes. The first question,
19 yes, it was modeled as a value and represents the failure
20 probability to move to the remote shutdown console.
21 So, I don't know the details, but those numbers were
22 driven by, came from NUREG/CR-6850. I don't know the
23 details for it.

24 CHAIRMAN STETKAR: Okay. Okay.

25 DR. TANAKA: But there was some kind of

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1 value.

2 CHAIRMAN STETKAR: Okay. You basically
3 used -- there is some estimation in there. So, you used
4 that? Okay. Thanks.

5 MR. NIRASAWA: The probability, the
6 approximate, 0.2, this is discussed in the previous RHRS
7 pumps.

8 CHAIRMAN STETKAR: Okay. It is just that,
9 when you said you included credit for it, that raised
10 a flag because I actually didn't look at that part in
11 detail. So, I am not very well-versed on what was done.

12 By the way, one more point that I wanted
13 to raise, and I should have earlier, you didn't have
14 a slide on Human Reliability Analysis in the discussion
15 of the internal events at power. One thing that I
16 noticed was that a number of human actions, if I go to
17 the Human Reliability Analysis chapter of the PRA -- and
18 I have forgotten which chapter it is -- there are tables
19 for each human action. So, I can go to each human action
20 basic event that is in the PRA, find a table that does
21 a simplified task analysis, develops a value for each
22 task, sums over the tasks, and then says, well, these
23 are characterized as median values and I will take a
24 log-normal distribution with an error factor of five,
25 and here is the mean value of that uncertainty

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1 distribution.

2 I had a really difficult time, No. 1, I had
3 a difficult time because in many cases, if I added up
4 the values, they came out different. If I added the
5 values for each of the individual tasks, they came out
6 different from the bottom-line number. So, I didn't
7 know why that was. That is a curiosity. I didn't look
8 at every table. I can give you spot-numbers, but I can't
9 say how pervasive it is.

10 What I did look at, and what I did notice,
11 is that there are a number of key human actions in the
12 study for which the 5th percentile value of the
13 uncertainty distribution is the value that is actually
14 used to quantify the human error probability in the PRA
15 model. And there is a justification that says, well,
16 we felt that the operators would be very well-trained
17 and very familiar. So, we will justify using the
18 lower-bound value, which is, indeed, the 5th percentile
19 of the human error probability uncertainty
20 distribution.

21 That disturbs me mightily. First of all,
22 if you apply a methodology, which you did, that develops
23 a mean value, one ought to use the mean value everywhere
24 because you have developed a methodology.

25 Second of all, it is really difficult in

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1 design certification space for me to understand how the
2 operators at any given plant that has yet to develop
3 their own emergency procedures and training can be 95
4 percent better than -- not 95 percent better -- but at
5 the 5th percentile of the error rate compared to the
6 whole industry. In my experience, on average,
7 everybody is average.

8 Now how important is this? It is about a
9 factor of eight difference. If you look at a log-normal
10 uncertainty distribution with an error factor of 5, the
11 difference between the mean value and the 5th percentile
12 is about a factor of 8.

13 And there are a number of human error
14 probabilities that are used in the model with that low
15 value. And indeed, a number of the most important
16 identified human errors are quantified that way. That
17 is also simply a statement of fact.

18 I understand what you did. I can read those
19 words. But it is just very, very, let's call it curious.

20 Telegraph for tomorrow: I would be
21 interested to see what the staff had to say about that
22 when they reviewed the Human Reliability Analysis. So,
23 this is something for the staff for tomorrow, if you
24 are taking notes.

25 MEMBER BLEY: Yes, but I didn't see that.

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1 CHAIRMAN STETKAR: No, it is hard to find.

2 I was looking for time windows, but there is no
3 discussion of available time and feasibility or anything
4 about timing. But when I went to go look for timing,
5 I, first of all, found out that 1 plus 1 plus 1 plus
6 1 didn't add up to 4; it added up to some other number.

7 And then, I found that the number that it didn't add
8 up to wasn't used in the fault tree, anyway; it was some
9 other number. And then, I found in the bottom of one
10 of these tables a little note saying: well, for this
11 action, we feel that they are very familiar and very
12 well-trained. So, we will use the lower bound. It is
13 real hard to find.

14 MEMBER BLEY: I have got to go look at it.
15 That certainly sounds outrageous.

16 CHAIRMAN STETKAR: It is not done across
17 the board, either. It is only for selected --

18 MEMBER BLEY: For the ones we want --

19 CHAIRMAN STETKAR: It is only done for
20 selected human actions. I don't know what criteria were
21 used to select those human actions. I didn't try to
22 divine why they were selected. I can just tell you it
23 is not used across the board, but it was used for a number
24 of the human actions that are identified when you look
25 at the importance rankings, not all of them, though.

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1 For example, it was not done for
2 feed-and-bleed cooling, which was identified as an
3 important action. Indeed, the numbers don't add up
4 there, but at least the mean value from the numbers that
5 don't add up was used.

6 It is just I will leave it there. I am
7 sorry, I wanted to bring -- I had a laundry list of things
8 here that I wanted to bring up in the context of the
9 Level 1 at-power models, and I missed that one while
10 I was making notes.

11 And I can confirm that at least -- you know,
12 I can look at cut set lists. I can look at the fault
13 trees. I can confirm that this percentile value was
14 used.

15 MEMBER SCHULTZ: And that is in the Level
16 1, you say, John?

17 CHAIRMAN STETKAR: It is in, yes, I mean,
18 that is right.

19 MEMBER BLEY: In the human factors.

20 CHAIRMAN STETKAR: You can find the
21 footnotes in the tables of the Human Reliability
22 Analysis, but it is not clear what it means until you
23 go to the fault tree models and see what actual number
24 was used for that basic event in the fault tree, and
25 generate the log-normal distribution to see that,

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1 indeed, it is that number.

2 MR. SPRENGEL: Tanaka-san, do you have any
3 response now or clarification needed?

4 DR. TANAKA: No. No. How we calculated
5 the median or provide how we calculated from the table?

6 CHAIRMAN STETKAR: Yes. Some of those
7 numbers, by the way, you may want to go back and check
8 them because some of the numbers don't sum up to the
9 number on the bottom. And there are some error bars
10 along the side. So, it is clear that some numbers have
11 been changed --

12 DR. TANAKA: Okay.

13 CHAIRMAN STETKAR: -- you know, in Rev. 3,
14 for example.

15 DR. TANAKA: Maybe it is not just simply
16 a sum, but --

17 CHAIRMAN STETKAR: In some places it is.
18 I couldn't figure out what was done, for example,
19 because in many places it is a simple sum; in other places
20 it is apparently not. And I tried many different
21 theories about what -- I tried mean values of
22 distributions and adding up the mean and regenerating
23 the log normal for the median. That didn't work.

24 DR. TANAKA: Okay.

25 CHAIRMAN STETKAR: And in other places it

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1 is a simple sum. So, I really don't know.

2 DR. TANAKA: We will check it.

3 CHAIRMAN STETKAR: Yes, that bottom, the
4 way the tables are organized, the first number you come
5 to is characterized as a median value with an error
6 factor. And then, typically, there is another line down
7 below which, indeed, is the mean value --

8 DR. TANAKA: Yes.

9 CHAIRMAN STETKAR: -- of that
10 distribution. The ones I spot-checked, indeed, the
11 ratio of the median to the mean was correct. So, I knew
12 that you were using value No. 1 as a median. I knew
13 you were using an error factor of 5.

14 DR. TANAKA: Yes.

15 CHAIRMAN STETKAR: And indeed, that other
16 value was the mean. And then, in the bottom of the table
17 there is a little explanation that says: well, for this
18 action, we think it is good training and good
19 familiarity. So, we will use the lower bound.

20 DR. TANAKA: Right. Yes.

21 CHAIRMAN STETKAR: So, you are familiar
22 with that?

23 DR. TANAKA: We will check it, yes.

24 CHAIRMAN STETKAR: Okay.

25 DR. TANAKA: Yes.

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1 CHAIRMAN STETKAR: I'm sorry to interrupt,
2 but, as I said, I had that laundry list of things, and
3 that was actually the last one that I wanted to get the
4 zinger in on.

5 (Laughter.)

6 DR. CURRY: Thank you. We appreciate it.

7 MEMBER BLEY: I have one more I want to toss
8 out for you to think about for tomorrow. I thought a
9 little more about that interfacing LOCA scenario. And
10 I would like you to go back and take a look at it.

11 You do two calculations. One is the chance
12 that you broach the RHR system. Look at the little
13 calculation you did. It looks like it is R5 factor of
14 1,000, just doing the arithmetic.

15 And then, you calculate, given you applied
16 pressure to the RHR system, what is the chance the pipe
17 breaks? And it is based on a failure rate something
18 like 10 to the minus 7 per hour foot, or something like
19 that. And I wonder where that number came from and what
20 is the basis for it. So, if you could fill us in on
21 those, that thing, I would appreciate it.

22 DR. CURRY: Do you have a reference for
23 that?

24 MEMBER BLEY: Well, it is the
25 initiating-event chapter on interfacing system LOCA.

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1 DR. CURRY: Okay.

2 MEMBER BLEY: There is one page there where
3 it does this calculation and talks about interfacing
4 system LOCA in the initiating-event section, Chapter
5 2.

6 DR. CURRY: And it was off by a factor --

7 MEMBER BLEY: Chapter 2 of the PRA.

8 DR. CURRY: Right, and what was off? The
9 initiating-event frequency was off by a factor of 1,000,
10 you feel, or --

11 MEMBER BLEY: Yes, essentially. If you do
12 a little, one-line calculation where you multiply three
13 numbers, at least my arithmetic comes out a factor of
14 10 to the minus 3 off, 10 to the 3 on it. And the other
15 one, I just don't know the basis for that number used
16 for the pipe failure rate, given it is subjected to RCS
17 pressure.

18 CHAIRMAN STETKAR: I didn't look at the
19 numbers. I know they assumed 100 pipe feet.

20 MEMBER BLEY: Yes.

21 CHAIRMAN STETKAR: So, that is somewhere,
22 but, I mean, I didn't --

23 MEMBER BLEY: I assumed they got that
24 right, but I could -- you know, that is another question.
25 But I didn't, either, except I saw it was very low to

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1 start with, and I didn't go back and check that until
2 later.

3 That's it for me on that one. I would just
4 like to get really convinced about that analysis.

5 DR. CURRY: All right. We will look at
6 that.

7 Moving on to flooding, I am going to skip
8 the usual pie chart because I think you know the routine.

9 Fundamentally, you see the references that
10 we used. Pipe rupture frequencies were from the EPRI
11 document, divided into the categories as specified in
12 that document.

13 Internal key features are that the reactor
14 building, essentially, is divided into two divisions,
15 an east and west side, by flood barriers. Water-tight
16 doors for safety-related SSC areas, the main control
17 room and the reactor building exits. And once again,
18 there is a transfer to the remote shutdown console, if
19 necessary, from the main control room to achieve safe
20 shutdown.

21 As I said, I will just skip the pie charts
22 and the data in the interest of time because you have
23 seen those.

24 Internal flooding assumptions. There is
25 no credit for action by the operators outside of the

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1 main control room.

2 And if we have a break or a flood in the
3 heat exchanger room, then we assume, due to the essential
4 service water, we assume it is isolated in 15 minutes.

5 And this just simply requires a pump trip.

6 As we mentioned, the east and west areas
7 are divided of the reactor building. So, the effect
8 of a flood is limited because of that division.

9 And floods from the emergency feedwater
10 system, they do contribute, but, once again --

11 MEMBER BLEY: On that first, the isolation
12 in 15 minutes, you didn't do a human reliability analysis
13 or do any chance that they don't do that? You just
14 assumed in 15 minutes it is wrapped up?

15 DR. CURRY: I think so. It took that
16 amount of water. And again, as we mentioned, it is a
17 simple action to terminate it. Sorry, Dr. --

18 MEMBER BLEY: Well, yes, but, you know, I
19 don't remember this thing. In the heat exchanger room,
20 which is what you are talking about, all you would have
21 is some trouble alarm probably coming in that you have
22 a full sump? Or how would the operators even know it
23 is going on, such that they would isolate it in 15
24 minutes? And if you have a good story on that, then
25 why don't we do an HRA? Why do we just assume 100 percent

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1 that it is wrapped up before the water goes everywhere?

2 DR. CURRY: Do we want to comment on that,
3 the diagnostics of the flood now or --

4 DR. TANAKA: No. I'm sorry, I couldn't
5 catch your question. We couldn't catch the question.

6 DR. CURRY: Well, basically, I think the
7 Committee is asking how do we know, how would an operator
8 know that we have flooding in that area. We have assumed
9 15 minutes. And we have explained that it is a fairly
10 straightforward action to terminate the event. But I
11 think the Committee member's question is, well, how do
12 we know it happens? And what are the diagnostics?

13 DR. TANAKA: Okay.

14 MEMBER BLEY: How do you know it happens,
15 know exactly where the water is coming from? And then,
16 once you have got that, why don't you use an NHRA kind
17 of model rather than just assume it is turned off in
18 15 minutes?

19 DR. CURRY: Scott, do you want to add
20 something?

21 MR. KIPPER: Scott Kipper from MNES.

22 Just one thing. The rooms do have leak
23 detection.

24 MEMBER BLEY: What kind?

25 MR. KIPPER: Just level sensors in the

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1 floor drains, yes.

2 MEMBER BLEY: In the sump?

3 Yes, I mean, to me, it is a big jump to say,
4 "I have got a sump alarm in some room and I am going
5 to shut off the pump that is in that room in 15 minutes."

6 CHAIRMAN STETKAR: Well, it is an essential
7 service water pump. It is not just any pump, either.

8 DR. CURRY: Right.

9 CHAIRMAN STETKAR: It is the kind of pump
10 that takes the heat from half of your plant.

11 (Laughter.)

12 MEMBER BLEY: Yes, you don't want to turn
13 that off in the first place.

14 CHAIRMAN STETKAR: I wouldn't.

15 MEMBER BLEY: But, in the second place, I
16 mean, you get sump alarms. Water comes from different
17 places. I have seen incident reports where people, when
18 they get one of those, say, "Oh, yeah, wasn't somebody
19 doing some work down there? Yeah, that's what that is.
20 I'm busy with something else now."

21 And this is, bam, I've got it. I know it
22 is there, and I am going to turn off the one pump that
23 is in that room.

24 Is there other water piping going through
25 that room? You know, how do we know for sure where the

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1 flooding is coming from? It just seems a leap to me.

2 So, I want to hear the story.

3 CHAIRMAN STETKAR: A plant that will remain
4 unnamed, for obvious reasons in about two minutes,
5 filled up the entire space in the annular region between
6 their containment shell and their external annulus to
7 a depth of about 30 meters with service water because
8 it was leaking. A sump was full of water, and the one
9 sump-level switch didn't work. Nobody knew about it.

10 MEMBER BLEY: That is a lot of water coming
11 in.

12 CHAIRMAN STETKAR: That was a lot of water.

13 MEMBER BLEY: I don't know for sure how big
14 this room is.

15 CHAIRMAN STETKAR: That is an actual event
16 that happened in a real plant.

17 DR. CURRY: Unless we want to go further
18 today, we can consult with the flood panelists.

19 DR. TANAKA: Yes, we will check with the
20 flood people.

21 MEMBER BLEY: Yes, and I don't know what
22 kind of connections you have. If there is a flexible
23 coupling on this, like there is on a lot of service water
24 systems, you can get a really big hole suddenly, and
25 you might be seconds to fill up the whole room rather

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1 than --

2 MEMBER SCHULTZ: It was also just
3 interesting that this was what was selected to apply
4 this approach, the particular approach. Everything
5 else was presumed no credit.

6 MEMBER BLEY: That's right.

7 CHAIRMAN STETKAR: On the CCW, I haven't
8 looked at the plant layout, and be careful here because
9 we are treading on possible proprietary information.
10 I don't know whether certainly in this forum whether
11 the CCW heat exchanger rooms are entirely sealed or are
12 they open to other areas? And you don't have to answer
13 if you think it is too close to proprietary information,
14 but that also hinges on some of Dennis' questions
15 about --

16 MEMBER SCHULTZ: From a flood protection
17 perspective, though, is that?

18 CHAIRMAN STETKAR: Yes.

19 MEMBER BLEY: Right. And back on that same
20 thing, you know, I don't know if you have anything else,
21 but you surely have component cooling water in there,
22 too.

23 CHAIRMAN STETKAR: So, from what Steve
24 said, it is curious that this approach was applied to
25 this particular scenario, which means it almost has to

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1 be affecting something more than that train of ESW and
2 that train CCW. Single-train failures aren't going to
3 get you much of anything. So, you could essentially
4 afford to assume that they didn't isolate that break,
5 stop that break.

6 DR. TANAKA: The consequence of this kind
7 of flood will cause an effect on two trains.

8 CHAIRMAN STETKAR: Okay. Yes.

9 DR. CURRY: Moving on, I think the key point
10 of this next slide is the bottom line in terms of
11 identifying the source of the flooding information.
12 And there was a sensitivity study performed indicating
13 that more recent flood data would reduce the flooding
14 risk.

15 That is all we had planned to present on
16 internal flood.

17 So, if the Committee is ready, we will go
18 to low-power shutdown. The first bullet on this slide
19 is meant to indicate that fundamentally the internal
20 vents at power, PRA models were used to develop the
21 low-power shutdown PRA. RHR was obviously added to
22 those models for that purpose.

23 There are a number of plant operating states
24 for low-power shutdown, 13 in particular. The mid-LOOP
25 operation states are 4 and 8. So, detailed, because

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1 of the risk profile, a detailed sequence quantification
2 was performed for those reduced-inventory states.

3 CHAIRMAN STETKAR: Jim, again, this is an
4 area I didn't look at excruciating details of the
5 low-power shutdown models, but 13 POSes, many features
6 from things that I looked at looked very familiar to
7 me.

8 One question I had is that many
9 currently-operating plants that I have at least worked
10 with for low-power and shutdown models have changed
11 their outage management philosophy. So, for example,
12 when I was operating at Zion, we, indeed, did drain to
13 mid-LOOP in what you are calling POS 4.

14 Many plants now offload the entire core
15 during refueling outage, put the fuel over in the
16 spent-fuel pool, and any maintenance that requires them
17 to drain down to mid-LOOP is typically performed while
18 the core is in the spent-fuel pool. And they do that
19 for a variety of reasons, but risk is one; the other
20 is kind of the efficiency of the fuel shuffle.

21 So, my question is, do APWRs in Japan drain
22 down to mid-LOOP in these pre-flooding the cavity and
23 post-draining the cavity? Your plant operating states
24 5, 6, and 7 are a cavity flooded up and you say, well,
25 the risk is insignificant in those.

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1 The question is, is the drain to mid-LOOP
2 in 4 and 8 consistent with operating practice in Japan
3 for APWRs? As I said, I know from Zion back 30 years
4 ago it is what we did, but the industry has learned some
5 lessons from that. And I don't know what all plants
6 in the U.S. do now. I am not familiar. I know that
7 a few not in the U.S., but European plants that I have
8 looked at, and in other countries, do not drain to
9 mid-LOOP until all the fuel is out of the core.

10 And if that is the case here, now we have
11 skewed the low-power-in-shutdown risk considerably
12 because those are the only two plant operating states
13 that contribute, based on something that might not
14 necessarily be consistent with actual operating
15 practices that we would expect. So, I don't know what
16 your experience is, if you have any from the Japanese
17 plants.

18 DR. TANAKA: Okay. First, we don't have
19 any APWRs in Japan. So, I will talk about the PWRs,
20 operating PWRs.

21 CHAIRMAN STETKAR: I said APWR.

22 DR. TANAKA: APWRs, there is no APWR yet.

23 CHAIRMAN STETKAR: Oh, that's right. No,
24 I'm sorry.

25 DR. TANAKA: Okay.

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1 CHAIRMAN STETKAR: There is the "hat
2 trick," Dennis.

3 (Laughter.)

4 MEMBER BLEY: Congratulations.

5 CHAIRMAN STETKAR: Do you have any
6 operating experience for not-so-advanced Pressurized
7 Water Reactors in Japan, how they conduct their
8 refueling outages?

9 (Laughter.)

10 DR. TANAKA: Yes. They move to mid-LOOP.

11 CHAIRMAN STETKAR: They do go to mid-LOOP?

12 DR. TANAKA: Yes.

13 CHAIRMAN STETKAR: Okay. Okay. All
14 right. I am not going to ask -- what Luminant does at
15 Comanche Peak Units 1 and 2 is kind of irrelevant because
16 this is for the design certification. So, at least this
17 characterization of the outage profile is, indeed,
18 consistent with current operating practices in Japan.
19 Okay.

20 Thanks. That helps.

21 DR. CURRY: Now design features to reduce
22 shutdown risk. And we talked about mid-LOOP a moment
23 ago, but the first bullet is there are no penetrations
24 below the top of the core. So, a draindown event from
25 the vessel, the probability of that is minimized.

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1 There is an interlock for the automatic
2 isolation of the low-pressure letdown line when
3 inventory is reduced, and the location of the steam
4 generator nozzle dams of the steam generators allows
5 the nozzle dams to be installed on the water level is
6 above the top of the main coolant piping.

7 Generic Letter 88-17 of the US-APWR is
8 consistent with Generic Letter 88-17, which requires
9 that the hatch be closed prior to reaching harsh
10 conditions in containment, which is defined as 200
11 degrees F in containment. So, the US-APWR is committed
12 to that requirement. And there is a main stand
13 inventory to the RCS, as required by 88-17.

14 There is the pie chart just kind of showing
15 risk from all contributors at the design certification
16 stage, at-power events, fire, and flood.

17 This, again, is talking about mid-LOOP
18 condition and the potential for air ingestion, vortexing
19 of the CS RHR pumps.

20 The automatic isolation of low-power
21 letdown line actuates at a set point above which the
22 pumps would be damaged by air ingestion. That is set
23 point is above that main coolant piping level.

24 And the PRA makes much more conservative
25 assumptions in terms of inventory that exists with

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1 respect to actual planned practice.

2 CHAIRMAN STETKAR: Jim, can you go back to
3 that pie chart? I guess I didn't appreciate something.

4 I read somewhere that the mid-LOOP
5 conditions were essentially the whole story for
6 low-power in shutdown. If I look at this pie chart,
7 I see a big fraction of the total coming from POS 8-3,
8 which is the mid-LOOP after refueling, and a relatively
9 small fraction -- when I say "relative," relatively,
10 it is small; it is still a large fraction -- coming from
11 POS 4, which is mid-LOOP pre-refueling.

12 And I was curious why is POS 8 so much more
13 important than POS 4, especially, if nothing else, the
14 decay heat is a lot higher in POS 4. So, boiloff times
15 would be quicker in POS 4 than POS 8, if the analysis
16 was taken to that level of detail. And it may not be
17 for this purpose.

18 But it is just still curious that POS 8,
19 in particular, since it is also modeled as mid-LOOP,
20 as I understand, is so much more important than 4. Do
21 you have any insights about why that is?

22 And I happened to appreciate it because I
23 was looking at a kind of bigger picture why is mid-LOOP
24 so important.

25 DR. CURRY: So, you are comparing POS 4-3

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1 LOOP with POS 8-3 LOOP?

2 CHAIRMAN STETKAR: Well, yes, or is there
3 something else about POS 8? Is POS 4-3 and 8-3 the
4 particular mid-LOOP configurations? What is the
5 difference between 8-1 and 8-3, for example?

6 DR. CURRY: 8-1 is RHR cooling. So, that
7 is mid-LOOP operation to draindown.

8 CHAIRMAN STETKAR: To draindown? Okay.

9 DR. CURRY: Right.

10 CHAIRMAN STETKAR: Okay.

11 DR. CURRY: 8-2 is mid-LOOP operation to
12 nozzle dam removal and manway installation.

13 CHAIRMAN STETKAR: Okay.

14 DR. CURRY: And 3 is mid-LOOP operation to
15 refilling the RCS.

16 CHAIRMAN STETKAR: Refilling?

17 DR. CURRY: Yes.

18 CHAIRMAN STETKAR: Okay. I will have to
19 think about this a little bit more. I was just curious
20 that I see an awful lot of 8's there and not many 4's.

21 DR. CURRY: Yes.

22 CHAIRMAN STETKAR: There must be something
23 specific about the configurations that I am not
24 appreciating. So, I will look at that tonight.

25 DR. CURRY: Okay. Well, we talked about

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1 the set point above the point associated with potential
2 air injection and the fact that the PRA was even more
3 conservative in terms of assumed water levels.

4 So, our conclusions are that the US-APWR
5 does have advanced features and meets the Commission's
6 safety goals. And contributors to this are the four
7 trains of safety-related systems, the in-containment
8 refueling water storage pit, and we talked about that
9 we believe the full digital instrumentation and controls
10 enhances the human/system interface. The advanced
11 accumulators, doing away with the need for low-pressure
12 injection system. Safety trains are physically
13 separated from a fire perspective and from a flood
14 perspective. So, we provide separation in terms of
15 divisions or subsystems.

16 The final few slides are a summary of the
17 open items in the SER that I expect the staff will go
18 over in more detail.

19 CHAIRMAN STETKAR: Yes.

20 DR. CURRY: We owe the staff several
21 thermal hydraulic analyses which are associated with
22 RAI 750. I think most of the other items we have provided
23 responses to the staff.

24 Major topics, if you were to kind of take
25 a cut through these and take a look at them, have to

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1 do with documenting COL items, which are done in 19.3,
2 and the staff helped us quite a bit in beefing-up that
3 section to assure an effective transfer to COL
4 applicants.

5 Documenting risk insights. If you look at
6 Table 19.1-119, documenting uncertainties. Our method
7 of conformance with 88-17 is one of the items here.

8 So, I think that probably summarizes the
9 key points of where we are. And the vortexing issue
10 is being addressed in Chapter 5. That is row 13 on the
11 list.

12 So, with that, I would conclude our
13 discussion of Section 19.1.

14 Yes, please, Nirasawa-san?

15 MR. NIRASAWA: Please change the page.

16 DR. CURRY: Change the page? Oh, so sorry.

17 Okay. Thank you, Nirasawa-san.

18 Okay. So, I think that kind of concludes
19 our summary of what we had planned to say about Section
20 19.1 And this might be a good place -- we can pick up
21 with 19.2 tomorrow, if the Committee likes.

22 CHAIRMAN STETKAR: It is up to you, because
23 it has been a long day. I don't want to risk running
24 long tomorrow, for a variety of reasons. We can either
25 run to 5:30 -- let me ask our severe accident expert,

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1 who is sitting in the corner, do you think we can get
2 through the five or six slides on this in 20 minutes
3 or not?

4 MEMBER REMPE: Well, there's not many
5 slides. But I have another question that is down deep
6 in the details of the MAAP analysis and the assumptions
7 that I would like to ask. They don't really show up
8 here on the slides.

9 DR. CURRY: We have our team here. I think
10 we would be happy to go through it.

11 CHAIRMAN STETKAR: Will it take --

12 MEMBER REMPE: It is not that long. It is
13 just that is more of interest than the material on the
14 slides to me because --

15 CHAIRMAN STETKAR: I'll tell you what.
16 Let's see if we can through these slides. If we don't
17 get to Joy's question, we can at least get the question
18 quickly out on the table. If it is something that MHI
19 can do some homework at night --

20 MEMBER REMPE: Yes, that would be good.

21 CHAIRMAN STETKAR: -- let's do that.

22 MEMBER REMPE: I don't know; maybe they
23 will have a good answer real quick for me.

24 CHAIRMAN STETKAR: Joy, why don't you get
25 your question out on the table quickly, so we make sure

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1 we have that? And then, we will see if we can get through
2 the slides also.

3 MEMBER REMPE: Sure. Okay.

4 So, again, it comes from a proprietary
5 document, but you specify it in your PRA, in Chapter
6 14, which is in File 110 of the PRA document, that your
7 fuel melting assumption was a certain value. Can I say
8 temperatures? Is it allowed here? Is it proprietary?

9 CHAIRMAN STETKAR: You have at least
10 pointed them to what it is.

11 MEMBER REMPE: Okay. And that is not the
12 melting temperature for UO2. That is not the liquidus
13 temperature ZrO2. And so, what is the basis? It is
14 quite low again. And I just was wondering what that
15 basis was for the melting temperature you assumed in
16 that.

17 MR. GODA: Basis.

18 MEMBER REMPE: Basis?

19 MR. GODA: Basis.

20 MEMBER REMPE: It is much lower.

21 MR. GODA: I'm sorry, I cannot answer right
22 now.

23 MEMBER SCHULTZ: Can you show or point --

24 MEMBER REMPE: I can show you.

25 MEMBER SCHULTZ: No, not me.

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1 MEMBER REMPE: Okay. I can show you the
2 value and I can show you the page.

3 The reason I am asking that is because years
4 ago -- and again, I have not kept up with more recent
5 versions of MAAP -- but a long time ago, MAAP stopped
6 hydrogen generation when the fuel reached a melting
7 temperature. So, if you have a very low melting
8 temperature assumed in your MAAP analysis, you might
9 have less hydrogen generation, unless the PIRT has been
10 changed.

11 MEMBER BLEY: Than real.

12 MEMBER REMPE: I'm sorry, you know this is
13 true still?

14 MEMBER BLEY: No, no, I said less hydrogen
15 than the real case.

16 MEMBER REMPE: Than real, yes. So, have
17 you underestimated hydrogen generation because you have
18 fortuitously picked a low melting temperature of fuel
19 is what I am asking. So, it would be good to try to
20 understand that assumption.

21 (At this point, the Applicant has asked that
22 the exchange between Member Rempe and Mr. Goda be
23 stricken from the record because it contains proprietary
24 information.)

25 MR. GODA: I am sorry, if it is quite

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1 different from mine, that is in the MAAP variation.
2 Mine is in the MAAP code. Oh, that is Kelvin. Oh, I
3 see. I see. I see.

4 (At this point, the Applicant has asked that
5 the exchange between Member Rempe and Mr. Goda be
6 stricken from the record because it contains proprietary
7 information.)

8 MEMBER REMPE: Why was that number assumed?

9 MR. GODA: Well, I cannot answer correctly,
10 but it is set in a conservative way.

11 MEMBER REMPE: Okay. So, it might be
12 conservative --

13 MR. GODA: Yes.

14 MEMBER REMPE: -- because you get the fuel
15 to locate to the lower head.

16 MR. GODA: That's right.

17 MEMBER REMPE: But --

18 MR. GODA: And also, another one, regarding
19 the hydrogen generation -- (At this point, the Applicant
20 has asked that the exchange between Member Rempe and
21 Mr. Goda be stricken from the record because it contains
22 proprietary information.)

23 DR. CURRY: You are correct that MAAP won't
24 generate 100 percent metal-to-water reaction.

25 MEMBER REMPE: Right.

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1 DR. CURRY: So, it is common practice to
2 kind of mechanically add --

3 MEMBER REMPE: Bump it up.

4 DR. CURRY: That is right. So, you are
5 correct with that. But, as Goda-san said, then it was
6 kind of input into the code anyway, rather than just
7 relying on the MAAP number.

8 MEMBER REMPE: Okay. That helps me. So,
9 I am glad I got to ask that tonight and think about it
10 and what was done, then, subsequently.

11 CHAIRMAN STETKAR: Great.

12 Let's see if we can get through these
13 slides.

14 DR. CURRY: Okay. In terms of severe
15 accident evaluation, the design features from an average
16 standpoint, four-train safety-grade reactor protection
17 system and a DAS diverse actuation system. There was
18 no credit for tripping, for operator action to trip.

19 Mid-LOOP operations, we talked about that.
20 The four-train RHR design and the draindown path
21 interlock with water level. Station blackout, we have
22 talked about that. Four Class 1E GTGs and two alternate
23 AC sources.

24 Fires, we have talked about the separation
25 of safety systems into the trains.

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1 And we also talked about the RHR designed
2 not to fail by overpressure, and we discussed that.
3 There may have been an action item on that. I will look
4 through our notes.

5 The evaluation of severe accident
6 phenomena, the thermally-induced steam generator tube
7 rupture, I think at this point it is a confirmatory item,
8 but it was evaluated based on current understanding
9 about temperature-induced steam generator tube rupture.

10 Ex-vessel steam explosion, that has also
11 been addressed, considering a range of uncertainties
12 for the evaluation of steam explosion.

13 Hydrogen burning, that I think, Goda-san,
14 because of the Gothic prediction of potential hydrogen
15 concentration in the RWSP, we made a design change to
16 deal with that.

17 MR. GODA: Yes.

18 DR. CURRY: That is battery-powered
19 igniters, dedicated igniter system. And that is
20 documented in an RAI response as well.

21 So, on the next slide, we are talking about
22 the control of hydrogen.

23 Core debris coolability, we have the
24 ability to flood the reactor cavity with multiple
25 systems, and then, the geometry, both floor area and

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1 depth are relevant to core coolability.

2 MEMBER REMPE: You did some standalone
3 calculations for the flooding height. I didn't see
4 anything, again, in this section, in the MAAP analysis
5 that you assumed that a certain amount of water comes
6 out, and you actually have done some calculations with
7 MAAP showing that water level increasing to where it
8 did? Or how did you come up with the flooding height
9 in cavity?

10 MR. GODA: Flooding height? You mean --

11 MEMBER REMPE: The water height in the
12 cavity.

13 MR. GODA: The cavity? Yes, we have the
14 calculation, but that is an internal memo of MHI.

15 MEMBER REMPE: Okay. We will see if the
16 staff did some audit calculations tomorrow to see if
17 there is anything. But, okay.

18 DR. CURRY: And high-pressure melt
19 ejection, we mentioned earlier the separate line. This
20 was the Chairman asked whether that was considered in
21 the Level 1 PRA, but there is a dedicated line, severe
22 accident, a depressurization valve line.

23 You also talked about the debris trap
24 earlier.

25 CHAIRMAN STETKAR: In the structure of your

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1 models -- and I meant to check this last night and I
2 forgot -- you have your containment systems event tree,
3 CSET, and your containment phenomenological event tree.

4 What we are talking about here, the phenomena are out
5 in CPET.

6 I thought that I read that the CSETs are
7 linked directly to the core damage event sequences.
8 Is that correct? In other words, it is quantified as
9 one integrated model? Is that the way the model was
10 assembled?

11 And in particular, I want to make sure that,
12 indeed, if electric power was not available, for
13 example, in the Level 1 full-power PRA model to the
14 safety depressurization valves, for example, and
15 perhaps also to the depressurization valves, that that
16 condition, indeed, was transferred through the CSET to
17 the appropriate plant damage state, so that that
18 frequency was correctly accounted for. Was it?

19 And were the fire protection pumps
20 explicitly modeled in the CSET, so that if they were
21 not available for alternate, at least alternate cooling
22 of the charging pumps, where I know there is credit for
23 them, they were also not available for flooding the
24 reactor cavity?

25 DR. CURRY: So, you are really asking about

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1 dependencies as we --

2 CHAIRMAN STETKAR: Yes, in other words, it
3 models it completely. If I have confidence of that,
4 I have confidence in risk spectrum to solve cut sets.

5 I just didn't look at enough detail. I read some words
6 that it was linked, and therefore, those intermediate
7 ACLs, or whatever you call them, really don't mean
8 anything.

9 DR. TANAKA: Yes, it is linked.

10 CHAIRMAN STETKAR: It is linked?

11 DR. TANAKA: It is linked and it is
12 propagated.

13 CHAIRMAN STETKAR: Oh, good. Good.
14 Thanks.

15 DR. CURRY: Okay. So, this is a little bit
16 repetitive. The steam explosion, low probability of
17 steam explosion, and the containment is designed to
18 withstand that.

19 The temperature-induced steam generator
20 tube rupture, we mentioned the dedicated
21 depressurization line.

22 CHAIRMAN STETKAR: Jim, the challenges to
23 that depend on what is going on on the secondary side
24 of the steam generators in the Level 1 PRA model. It
25 comes back to the question I asked earlier. The Level

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1 PRA model does not model steam really. It assumes
2 that you have enough available. But, in particular,
3 it doesn't model stuck-open valves.

4 So, for example, if you go to what is
5 characterized now as a high-pressure melt, with a
6 stuck-open valve on one steam generator, if it is a
7 relief valve or a safety valve, or common stuck-open
8 valves, like the turbine bypass valves that are not
9 isolated, you will have low-pressure, dry conditions
10 on the secondary sides of one or more steam generators.

11 That condition, you don't know the
12 frequency of that condition from the Level 1 models right
13 now. So, I am curious how you quantified the frequency
14 of scenarios that, indeed, essentially, excite the need
15 to depressurize the primary system, so you don't get
16 a temperature-induced tube rupture.

17 Now I understand how you might know that
18 from like a steamline break that goes to core damage,
19 you know, some small subset of events. But I don't know
20 how you account for the other frequency. I don't know
21 how important it is because --

22 DR. CURRY: Right.

23 CHAIRMAN STETKAR: -- I just don't.

24 DR. CURRY: So, basically, the
25 contribution of the secondary side being at low pressure

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1 due to a stuck-open valve?

2 CHAIRMAN STETKAR: Yes. Yes. Again,
3 these tend --

4 MR. GODA: I can answer.

5 CHAIRMAN STETKAR: -- to be high-pressure
6 scenarios. So, because of that, you probably don't have
7 feedwater flow. So, one or more steam generators are
8 going to blow down. So, you get the dry low on the
9 secondary side.

10 MR. GODA: We have communicated with the
11 NRC staff as well about that here. And then, evaluated
12 the frequency of a stuck-open valve, stuck-open main
13 steamline valves as well in our EPET, Extended Progress
14 Event Tree Model. And that also we unstuck. We
15 communicated through the RAI.

16 CHAIRMAN STETKAR: Okay. Thanks. I will
17 have to look at that. Thanks. Thanks a lot. That
18 helps. Thank you.

19 DR. CURRY: So, in summary, basically, the
20 design options and changes that we talked about
21 represent those that were found to be cost-beneficial
22 in terms of severe accident mitigation, and there were
23 no additional design alternatives found to be
24 cost-beneficial.

25 We have one open item in this area. It has

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1 to do with the survivability of components in a severe
2 accident environment.

3 MEMBER SCHULTZ: Jim, I just have to ask
4 here, what process was used to determine the
5 quantification of cost-beneficial? What does that
6 mean? In other words, what analysis or approach was
7 used to do the cost/benefit analysis?

8 DR. CURRY: Goda-san, do you want to
9 comment?

10 MR. GODA: Okay. We performed SAMDA
11 evaluation in accordance with instructions provided in
12 a NUREG report, NUREG -- I don't remember the number,
13 but there are two reports about the SAMDA. So, we just
14 looked at, referenced those ones, those instructions.

15 MEMBER SCHULTZ: That gives me a benchmark
16 as to where you were. Thank you.

17 MEMBER REMPE: Vessel failure would be
18 impacted by the temperature of the material relocating
19 to the lower head and the heat transfer on the outside
20 of the vessel, which it seemed to me there would be some
21 uncertainty. Did you consider uncertainty in vessel
22 failure timing and some of the parameters that are
23 predicted?

24 MR. GODA: You mean in SAMDA?

25 MEMBER REMPE: No. No, no. Just with

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1 your MAAP analysis and how you quantified the releases
2 as a function of time during various severe accident
3 scenarios.

4 MR. GODA: Well, we do not do some
5 particular sensitivity studies using a MAAP code about
6 that timing for --

7 MEMBER REMPE: You did do some?

8 MR. GODA: No. No, we did not. In
9 specific, you mean absolute, right?

10 MEMBER REMPE: Right. Because it would be
11 affected by some of the user-defined input parameters
12 for MAAP as well as the heat transfer from the lower
13 head to whatever.

14 MR. GODA: No, no, we didn't. No, we did
15 not do that, that sensitivity. The ex-vessel, we did
16 perform it, but in the in-vessel we did not.

17 MEMBER REMPE: Okay.

18 CHAIRMAN STETKAR: Any members have any
19 other questions for MHI?

20 (No response.)

21 If not, again, in the interest of our
22 purpose here, are there any members of the public who
23 have any comments regarding the design certification,
24 Chapter 19?

25 (No response.)

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1 If not, thank you very much.

2 Do you have a question?

3 (Laughter.)

4 DR. CURRY: No questions on the record, but
5 I just would remind the Chairman there were a couple
6 of action items that we want to go over with him.

7 CHAIRMAN STETKAR: I have them, and I will
8 do that offline, so I get the right references.

9 Thank you very much.

10 We finished one minute ahead of where I
11 thought we might finish. So, that was excellent.

12 And you have stamina.

13 (Laughter.)

14 Thank you very much.

15 We will recess until tomorrow morning.

16 (Whereupon, the above-entitled matter went
17 off the record at 5:29 p.m.)

18

19

20

21

22

23

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Presentation to ACRS Subcommittee

Chapter 17:
Quality Assurance
and Reliability Assurance

February 21, 2013

Mitsubishi Heavy Industries, Ltd.

MHI Presenters



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Acronyms



ACRS	:Advisory Committee on Reactor Safeguards
APWR	:Advanced Pressurized Water Reactor
CCF	:Common Cause Failure
CFR	:Code of Federal Regulations
COL	:Combined License
DCD	:Design Control Document
D-RAP	:Design Reliability Assurance Program
EP	:Expert Panel
FV	:Fussell-Vesely Importance
ITAAC	:Inspection, Test, Analysis, and Acceptance Criteria
MHI	:Mitsubishi Heavy Industries, Ltd.
MNES	:Mitsubishi Nuclear Energy Systems, Inc.
NEI	:Nuclear Energy Institute
NRC	:Nuclear Regulatory Commission
OE	:Operating Experience
PRA	:Probabilistic Risk Assessment
QA	:Quality Assurance
QAP	:Quality Assurance Program
QAPD	:Quality Assurance Program Description
RAI	:Request for Additional Information
RAP	:Reliability Assurance Program
RAW	:Risk Achievement Worth
SE	:Safety Evaluation
SSC	:Systems, Structures, and Components

Contents of DCD Chapter 17



Section No.	Description
17.0	Quality Assurance and Reliability Assurance
17.1	Quality Assurance During the Design Phase
17.2	Quality Assurance During the Construction and Operation Phases
17.3	Quality Assurance Program
17.4	Reliability Assurance Program
17.5	Quality Assurance Program Description
17.6	Description of the Applicant's Program for Implementation of 10 CFR 50.65, the Maintenance Rule

Relationship between DCD and Topical/Technical Reports



DCD Section	Topical / Technical Reports
17.1 QA During the Design Phase	PQD-HD-19005
17.2 QA During the Construction and Operation Phases	NA
17.3 QA Program	PQD-HD-19005
17.4 Reliability Assurance Program	MUAP-07030
17.5 QA Program Description	PQD-HD-19005
17.6 Implementation of Maintenance Rule	NA

Topical Reports	PQD-HD-19005 (R4)	Quality Assurance Program Description For Design Certification of the US-APWR	April 2011
Technical Reports	MUAP-07030 (R3)	US-APWR Probabilistic Risk Assessment	June 2011

17.1 - Quality Assurance During the Design Phase



- **Quality Assurance (QA) for the US-APWR design certification is described in Section 17.5 for the standard plant design**
- **Combined License (COL) Applicants are responsible for QA applicable to site-specific design activities in the design phase**

17.2 - Quality Assurance During the Construction and Operation Phases



- **COL Applicants are responsible for QA applicable to construction and operation phases**

17.3 - Quality Assurance Program



- Quality Assurance Program (QAP) for the US-APWR design certification is described in Section 17.5
- COL Applicants are responsible for QAP applicable to site-specific design activities in the design phase and for the construction and operation phases

17.4 - Reliability Assurance Program

Introduction



- **Purpose of the US-APWR Reliability Assurance Program (RAP) activities is to provide reasonable assurance that:**
 - ✓ the US-APWR is designed, constructed, and operated in a manner that is consistent with the assumptions and risk insights for risk-significant SSCs,
 - ✓ risk-significant SSCs do not degrade to an unacceptable level during plant operations,
 - ✓ the frequency of transients that challenge risk-significant SSCs is minimized, and
 - ✓ risk-significant SSCs function reliably when challenged.

17.4 - Reliability Assurance Program

Introduction (cont.)



- **US-APWR Design Reliability Assurance Program (D-RAP) activities are implemented in accordance with:**
 - ✓ Section 17.4, “Reliability Assurance Program (RAP)” of NUREG-0800, “Standard Review Plan”
 - ✓ Interim Staff Guidance on Standard Review Plan, Section 17.4, “Reliability Assurance Program” DC/COL-ISG-018

- **Phases of the US-APWR D-RAP activities:**
 - ✓ **Design Certification Phase (Phase I)**
 - ✓ Site-specific Phase (Phase II)
 - ✓ Procurement, Fabrication, Construction, and Preoperational Testing Phase (Phase III)

17.4 - Reliability Assurance Program

D-RAP Implementation



- The process for identification of SSCs within the scope of the RAP (RAP SSCs) uses a combination of the following sources:
 - ✓ Probabilistic Risk Assessment (PRA)
 - ✓ Severe Accident Evaluation
 - ✓ Industry Operating Experience
 - ✓ Expert Panel (EP)

17.4 - Reliability Assurance Program D-RAP Implementation (cont.)

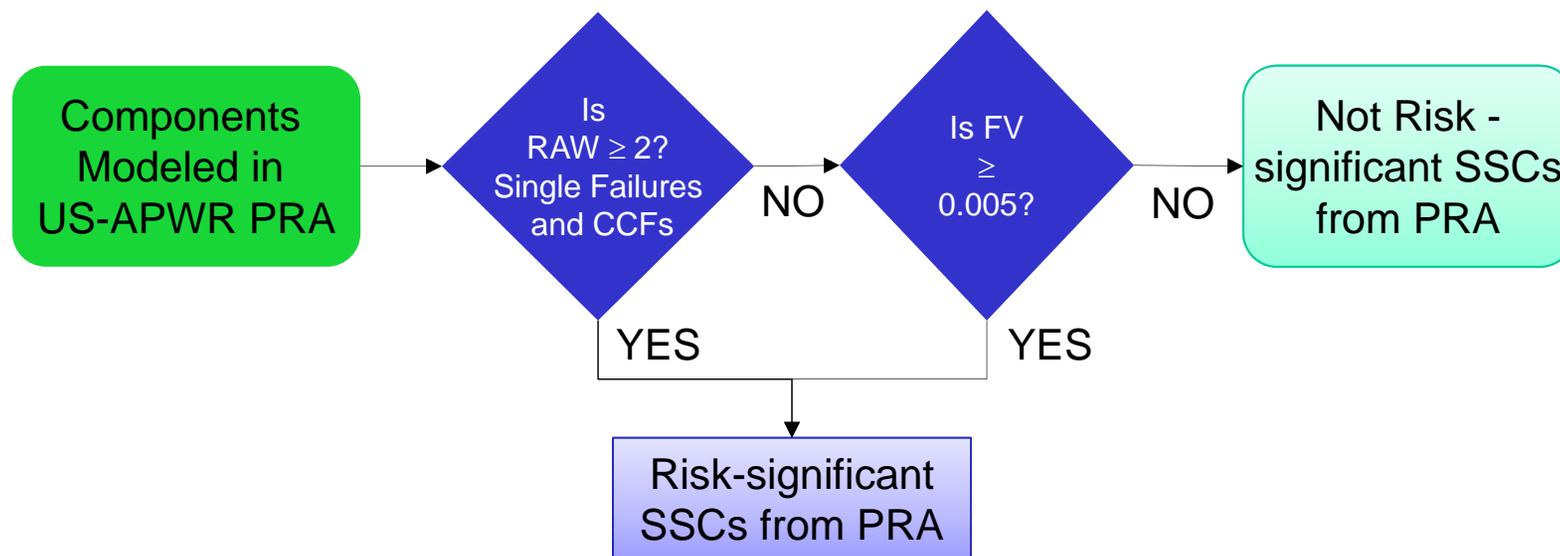


- **PRA Scope used to identify risk-significant SSCs:**
 - ✓ Level 1 and Level 2 Internal Events for Operations at Power
 - ✓ Level 1 and Level 2 External Events (Internal Fires and Internal Flooding) for Operations at Power
 - ✓ Low-Power and Shutdown Operations
 - ✓ Seismic (PRA-based Seismic Margin Analysis)

17.4 - Reliability Assurance Program D-RAP Implementation (cont.)



- ✓ SSCs that meet the importance criteria are identified as Risk-significant SSCs.



- ✓ SSCs evaluated in the PRA-based Seismic Margin Analysis are all identified as Risk-significant SSCs.
- ✓ PRA key insights and insights from severe accident evaluation are also taken into consideration.

17.4 - Reliability Assurance Program

D-RAP Implementation (cont.)



➤ Expert Panel

- ✓ EP reviews and finalizes the RAP SSC list using the following information:
 - PRA results (including SSCs deemed to not be risk-significant in the PRA)
 - Nuclear industry operating experience
- ✓ EP members must meet qualification for education and experience
- ✓ EP is comprised of members who have sufficient knowledge of:
 - PRA,
 - Plant Operations,
 - Plant Maintenance,
 - Design Engineering, and
 - Quality Assurance.

17.4 - Reliability Assurance Program D-RAP Implementation (cont.)



- **RAP SSCs are identified in DCD Table 17.4-1**
 - ✓ DCD Table 17.4-1 includes information regarding RAP SSCs, rationale for inclusion, risk-significant failure mode, and risk insights and key assumptions.

Table 17.4-1 Risk-significant SSCs (Sheet 1 of 51)

#	Systems, Structures and Components (SSCs)	Rationale ⁽¹⁾	Failure Mode ⁽²⁾	Insights and Assumptions
1	Accumulator injection system			
1	Discharge line secondary isolation check valves [SIS-VLV-102A (B, C, D)]	RAW(L1, L1-CC, L2-CC)	OD, EL, PR	The accumulator provides safety injection function for refill and re-flooding of the reactor vessel following a loss of coolant accident (LOCA). Also provides negative reactivity to shutdown the reactor. Single failure of any SSCs listed here has potential to cause failure of its dedicated train to inject coolant to RCS.
2	Boundary check valves (Discharge line) [SIS-VLV-103A (B, C, D)]	RAW(L1, L1-CC, L2-CC)	OD, EL, PR	
3	Discharge line isolation motor operated valves [SIS-MOV-101A (B, C, D)]	RAW(L1)	EL, PR	
4	Discharge line orifices train A through D [SIS-SRO-006A (B, C, D)]	RAW(L1)	PR	
5	Piping train A through D (Accumulator injection line)	RAW(L1) SM	EL, SS	
6	Accumulators [SIS-MTK-001A (B, C, D)]	EJ SM	SR, SS	

EJ = Engineering Judge
SM = SEISMIC Event

EL = External Leak [Valve, Pipe, Tube, Pump, Tank, Heat Exchanger(Shell/Tube)]
OD = Fail to Open [Valve]
PR = Plug [Valve, Orifice, Strainer, Heat Exchanger, Nozzle, Sump]
SR = Fail to Run [Pump, Gas Turbine Generator, Fan]
SS = Structural Failure by Seismic Hazard

17.5 - Quality Assurance Program

Description



- Basis of the US-APWR Quality Assurance Program Description (QAPD) is described in “*Quality Assurance Program (QAP) Description For Design Certification of the US-APWR*”, PQD-HD-19005
- MHI QAPD is based on the requirements of 10 CFR 50 Appendix B, 10 CFR 52, and NQA-1-1994 and was developed using the NEI template (NEI 06-14A)
- Topical report for the MHI QAPD Revision 4 (PQD-HD-19005 Rev. 4) was submitted April 8, 2011
- MHI QAPD Rev. 4 was approved by the NRC on November 9, 2011 as documented in the NRC’s Chapter 17 Safety Evaluation (SE) dated January 17, 2013

17.6 – Description of Applicant’s Program for Implementation of 10 CFR 50.65, the Maintenance Rule



- **COL Applicants are responsible for development of the program for implementation of 10 CFR 50.65, the Maintenance Rule**

Open Items from Chapter 17 SE



Open Item	Description	Resolution
17.05-01	An open item was created to track the NRC's inspection of MHI's implementation of the QAP.	The NRC performed an inspection in December 2010. Three violations were identified. MHI responded to the violations and also proposed changes to the QAP. The NRC accepted MHI's response. This Open Item is resolved as described in the SE.

Confirmatory Items from Chapter 17 SE



Confirmatory Item	Description	Resolution
17.04-52 (RAI 606-4827 Question 17.04-52)	It was not clear that industry OE is incorporated into expert panel D-RAP dominant failure mode selection.	MHI clarified DCD Tier 2 Section 17.4.7.1 to state that industry OE is used in D-RAP dominant failure mode selection. The proposed DCD changes from the RAI response will be incorporated into the next revision of the DCD.
17.04-63 (RAI 891-6268 Question 17.04-63)	The corrective action program described in the DCD only applied to design documents that address SSC reliability assumptions.	MHI clarified the extent of the corrective action program in relation to the D-RAP in DCD Tier 2 Section 17.4.4. The proposed DCD changes from the RAI response will be incorporated into the next revision of the DCD.
17.04-66 (RAI 891-6268 Question 17.04-66)	Additional failure modes for some D-RAP SSCs listed in DCD Table 17.4-1 were identified.	MHI updated DCD Tier 2 Table 17.4-1. The proposed DCD changes will be incorporated into the next revision of the DCD.
17.04-67 (RAI 891-6268 Question 17.04-67)	Several potential additional D-RAP SSCs were identified.	MHI updated DCD Tier 2 Table 17.4-1 to include the additional D-RAP SSCs. The proposed DCD changes from the RAI response will be incorporated into the next revision of the DCD.
17.04-68 (RAI 891-6268 Question 17.04-68)	Potential inconsistencies between Tier 1 and Tier 2 D-RAP – ITAAC were identified.	MHI clarified the discussion in DCD Tier 2 Section 17.4.8. The proposed DCD changes will be incorporated into the next revision of the DCD.



Presentation to the ACRS Subcommittee

US-APWR Design Certification Application Review

Safety Evaluation with Open Items for

CHAPTER 17: Quality Assurance and Reliability Assurance

February 21, 2013

Staff's Presentation Order

- **Jeffrey Ciocco**- US-APWR, Lead Project Manager
- **Tarun Roy** - Project Manager
- **Greg Galletti** - Construction Electrical Vendor Branch
- **Todd Hilsmeier** – PRA and Severe Accidents Branch

Conclusion:

There are no open items associated with this
CHAPTER 17 'Quality Assurance and Reliability
Assurance'



Luminant



LUMINANT GENERATION COMPANY

Comanche Peak Nuclear Power Plant, Units 3 and 4

ACRS US-APWR Subcommittee



**FSAR Chapter 17 –
Quality Assurance and
Reliability Assurance**

February 21, 2013



Luminant



Agenda

- Introduction**
- NRC Proposed License Condition**
- Site-specific Aspects**



Introduction

- FSAR uses IBR methodology**
- No departures from US-APWR DCD**
- All COL Items addressed in FSAR**
- No Chapter 17 SER Open Item**
- No SER Confirmatory Items**
- One NRC proposed License Condition**
- No contentions pending before ASLB**



NRC Proposed License Condition 17-1

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 conduct of NRC inspection of the Maintenance Rule program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the Maintenance Rule program has been fully implemented.



R-COLA Proposed License Condition

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, that supports planning for and conduct of NRC inspections of operational programs listed in FSAR Table 13.4-201 with the exception of the Fitness for Duty program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter for each applicable operational program until either the operational program has been fully implemented or the plant has been placed in commercial service, whichever comes first.



Site-Specific Aspects

17.1 Quality Assurance During the Design Phase

17.2 Quality Assurance During the Construction and Operation Phases

Quality Assurance for site-specific design, construction, and operation is described in Sections 17.3 and 17.5.



17.3 Quality Assurance Program

- ❑ Luminant responsible for establishing and implementing QAP for design, construction and operation**

- ❑ Luminant has delegated work, but retains responsibility for QAP**

- ❑ QA for preparation and review of COLA governed by NuBuild QAPP invoking elements of Units 1&2 QAP; both based on ANSI N45.2-1971 and meets 10CFR50 Appendix B**

- ❑ Luminant required Primary Contractor to have QAP based on NQA-1-1994 and meet 10CFR50 Appendix B**



17.4 Reliability Assurance Program

- ❑ **US-APWR D-RAP implemented in phases**
 - ❑ **Phase I – Design certification phase**
 - ❑ **Phase II – Site-specific phase**
 - ❑ **Phase III – Procurement, fabrication, construction, and preoperational testing phase**
- ❑ **Phase II and III programs continue structure and quality controls of Phase I and occur before fuel load**
- ❑ **Luminant responsible for D-RAP Phases II, III, and O-RAP**
- ❑ **The only site-specific Phase II risk-significant SSCs are UHS cooling tower fans (Table 17.4-201)**



17.4 Reliability Assurance Program (cont'd)

- ❑ O-RAP will be under Systems Engineering and Maintenance Engineering**
- ❑ O-RAP integrated into Maintenance Rule Program and other operational programs (ISI, IST, RVMSP, etc.)**



17.5 Quality Assurance Program Description

- ❑ Implementation of QAP will transition, upon issuance of COL and as project progresses, from QAPP to QAPD**

- ❑ Full transition to QAPD complete no later than 30 days prior to fuel load**

- ❑ Nuclear operations governed by fully-implemented QA program based on NEI 06-14A**



Luminant



17.6 Maintenance Rule Program

NEI 07-02A IBR



Acronyms

- ❑ **ACRS** **Advisory Committee on Reactor Safeguards**
- ❑ **APWR** **Advanced Pressurized Water Reactor**
- ❑ **ASLB** **Atomic Safety and Licensing Board**
- ❑ **COL** **Combined License**
- ❑ **COLA** **Combined License Application**
- ❑ **DC** **Design Certification**
- ❑ **DCD** **Design Control Document**
- ❑ **D-RAP** **Design Reliability Assurance Program**
- ❑ **FSAR** **Final Safety Analysis Report**
- ❑ **IBR** **Incorporated by reference**
- ❑ **ISI** **In-service Inspection**
- ❑ **IST** **In-service Testing**
- ❑ **NEI** **Nuclear Energy Institute**
- ❑ **NRO** **Nuclear Reactor Operations**
- ❑ **O-RAP** **Operations Reliability Assurance Program**
- ❑ **QA** **Quality Assurance**
- ❑ **QAP** **Quality Assurance Program**
- ❑ **QAPD** **Quality Assurance Program Description**
- ❑ **QAPP** **Quality Assurance Project Plan**
- ❑ **RAP** **Reliability Assurance Program**
- ❑ **RVMSP** **Reactor Vessel Material Surveillance Program**
- ❑ **SER** **Safety Evaluation Report**
- ❑ **SSC** **Structures, Systems, and Components**
- ❑ **UHS** **Ultimate Heat Sink**



Presentation to the ACRS Subcommittee

**Comanche Peak Nuclear Power Plant, Units 3 and 4
COL Application Review**

Safety Evaluation Report with Open Items for

CHAPTER 17: Quality Assurance and Reliability Assurance

February 21, 2013

Staff's Presentation Order

- **Stephen Monarque** - Comanche Peak COLA Lead Project Manager
- **Tarun Roy** - Project Manager
- **Greg Galletti** - Construction Electrical Vendor Branch
- **Todd Hilsmeier** – PRA and Severe Accidents Branch

Conclusion:

There are no open items associated with this
CHAPTER 17 'Quality Assurance and Reliability
Assurance'



Luminant



LUMINANT GENERATION COMPANY

Comanche Peak Nuclear Power Plant, Units 3 and 4

ACRS US-APWR Subcommittee



**FSAR Chapter 16 –
Technical Specifications**

February 21, 2013



Luminant



Agenda

- Introduction**
- SER Open Item**
- SER Confirmatory Item**
- Site-Specific Aspects**



Introduction

- ❑ FSAR uses IBR methodology**
- ❑ No departures from US-APWR DCD**
- ❑ All COL Items addressed in FSAR**
- ❑ One SER Open Item**
- ❑ One SER Confirmatory Item**
- ❑ License Conditions not applicable to TS**
- ❑ No contentions pending before ASLB**



Luminant



SER Open Item

16-1 RAI 90 (3113) Question 16-10

Provide full list of site specific SRs affected by the SFCP and deterministic values for the frequency assignments

Proposed resolution – will remain open until Luminant confirms that SFCP numerical values will be placed in FSAR



SER Confirmatory Item

16.4-1 RAI 26 (3287) Question 19-3

Incorporate methodology and adequacy requirements for PRA to support RITS in PTS

Proposed resolution – reference to methodology and technical adequacy are included in PTS. The final approved revision level of the methodology to be added to PTS.



Site-Specific Aspects

16.1 Technical Specifications

- US-APWR TS and Bases are adopted by the COLA in Part 4 and site specific information provided in bracketed areas**
- CPNPP Units 3 and 4 adopt RMTS and SFCP developed under RITS Initiatives 4b and 5b**
- Luminant will establish a CRMP and SFCP to be completed, reviewed, and approved by NRC prior to fuel load**
- Luminant following DCD TS changes still under discussion with NRC**



COLA Part 4

- Section A explains and justifies the 25 locations where COL Items are addressed with plant-specific information**
 - Plant-specific information replaces bracketed information in DCD as appropriate**
 - Brackets removed where PTS same as DCD**

- Section B provides complete PTS**



Acronyms

<input type="checkbox"/>	ASLB	Atomic Safety and Licensing Board
<input type="checkbox"/>	COL	Combined License
<input type="checkbox"/>	COLA	Combined License Application
<input type="checkbox"/>	CPNPP	Comanche Peak Nuclear Power Plant
<input type="checkbox"/>	CRMP	Configuration Risk Management Program
<input type="checkbox"/>	DCD	Design Control Document
<input type="checkbox"/>	FSAR	Final Safety Analysis Report
<input type="checkbox"/>	IBR	Incorporated by Reference
<input type="checkbox"/>	PTS	Plant-Specific Technical Specifications
<input type="checkbox"/>	PRA	Probabilistic Risk Assessment
<input type="checkbox"/>	RAI	Request for Additional Information
<input type="checkbox"/>	RITS	Risk-Informed Technical Specifications
<input type="checkbox"/>	RMTS	Risk-Managed Technical Specifications
<input type="checkbox"/>	SER	Safety Evaluation Report
<input type="checkbox"/>	SFCP	Surveillance Frequency Control Program
<input type="checkbox"/>	TS	Technical Specifications
<input type="checkbox"/>	US-APWR	United States Advanced Pressurized Water Reactor



Presentation to the ACRS Subcommittee

Comanche Peak Units 3 & 4 Combined License Application Review

SER/OI Chapter 16

Technical Specifications

February 21-22, 2013

Staff Review Team

- **Technical Staff**
 - ◆ Tech Reviewer
CTSB Branch: Theodore Tjader
- **Project Managers**
 - ◆ Lead PM: Stephen Monarque
 - ◆ Chapter PM: Tarun Roy

Technical Topic of Interest:

Risk-Managed Technical Specifications

- Comanche Peak Units 3 & 4 are adopting Risk-Managed Technical Specifications (RMTS, NEI-06-09)(aka Risk-informed Completion Times) and Surveillance Frequency Control Program (SFCP, NEI 04-10)(for licensee control of surveillance frequency adjustments) using risk information with specific PRA requirements.
- RMTS & SFCP require programs in TS Admin Controls section, referencing approved NEI 04-10 and NEI 06-09 methodology documents.

Technical Topic of Interest: Risk-Managed Technical Specifications

- Since the CP PRA reflecting the as-built/as-to-be-operated plant is not available at time of COL issuance, when TS must be complete, a TS methodology is needed per Option 3 of ISG-08 for completing a PRA that is adequate for the RMTS & SFCP applications.
- The staff has reviewed the CP TS methodology (with no open items) for completing a PRA adequate for the RMTS & SFCP applications.
- The methodology is referenced in the CPNPP 3&4 TS Admin Controls Sections 5.5.18 and 5.5.19, along with the referenced NEI 06-09 (RMTS) and NEI 04-10 (SFCP) documents.

Description of Open Items

- Open Item 16-1: The initial surveillance frequency values that are to be included in the Surveillance Frequency Control Program (SFCP) are the values listed in the DCD TS, except for the Ultimate Heat Sink (UHS) which is a site-specific system with its site specific values. The FSAR shall state that SFCP initial values will be the DCD surveillance frequencies and the specific UHS initial surveillance frequency values will also be specifically stated in the FSAR.

- Questions?



Presentation to ACRS Subcommittee

Chapter 19:
Probabilistic Risk Assessment and
Severe Accident Evaluation

February 21-22, 2013

Mitsubishi Heavy Industries, Ltd.

MHI Presenters



Lead Presenter:

Dr. James Curry, P.E.

MHI Technical Experts:

Hiroshi Goda

Takayuki Nirasawa

Dr. Futoshi Tanaka

MNES Support:

Hiroshi Hamamoto

Scott Kiffer, P.E.

Shinji Kiuchi

Kevin Lynn

Yuichi Tanaka

Kurt Walter

Edmond Wiegert, P.E.

Acronyms



AAC	:Alternate Alternating Current
AC	:Alternating Current
ACRS	:Advisory Committee on Reactor Safeguards
ANS	:American Nuclear Society
APWR	:Advanced Pressurized Water Reactor
ASEP	:Accident Sequence Evaluation Program
ASME	:American Society of Mechanical Engineers
ATWS	:Anticipated Transient Without Scram
CCDP	:Conditional Core Damage Probability
CCF	:Common Cause Failure
CCW/CCWS	:Component Cooling Water System
CDF	:Core Damage Frequency
COL	:Combined License
CS/CSS	:Containment Spray System
DC	:Direct Current
DCD	:Design Control Document
DCH	:Direct Containment Heating
DDT	:Deflagration to Detonation Transition
DEP	:Operator action to depressurize following SGTR
DVI	:Direct Vessel Injection
ECCS	:Emergency Core Cooling System
EFW/EFWS	:Emergency Feedwater System
EPRI	:Electric Power Research Institute
ESW/ESWS	:Essential Service Water System
FLML	:Failure to maintain water level
FSS	:Fire Protection Water Supply System
FWLB	:Feedwater Line Break
FV	:Fussell-Vesely Importance
GL	:NRC Generic Letter
GTG	:Gas Turbine Generator
HVAC	:Heating Ventilation and Air Conditioning

Acronyms (cont'd)



H/L	:Hot Leg
I&C	:Instrument and Controls
IEEE	:Institute of Electrical and Electronic Engineers
ISLOCA	:Intersystem LOCA
LHSI	:Low Head Safety Injection
LLOCA	:Large Break Loss of Coolant Accident
LOAC	:Loss of Vital AC Bus
LOCA	:Loss of Coolant Accident
LOCCW	:Loss of Component Cooling Water
LOCS	:Loss of CCW/ESW
LODC	:Loss of Vital DC Bus
LOFF	:Loss of Feedwater Flow
LOOP	:Loss of Offsite Power
LORH	:Loss of RHR
LPSD	:Low Power and Shutdown
LRF	:Large Release Frequency
LTOP	:Low Temperature Overpressure
MAAP	:Modular Accident Analysis Program
MCCI	:Molten Core-Concrete Interaction
MCP	:Main Coolant Piping
MCR	:Main Control Room
MGL	:Multiple-Greek-Letter
MHI	:Mitsubishi Heavy Industries, Ltd.
MLOCA	:Medium Pipe Break LOCA
MNES	:Mitsubishi Nuclear Energy Systems, Inc.
MSIV	:Main Steam Isolation Valve
NRC	:Nuclear Regulatory Commission
NUREG/CR	:Nuclear Regulatory Commission Documents prepared by Contractors
OI	:Open Item
OVDR	:Over Drain Down
PLOCW	:Partial Loss of Component Cooling Water

Acronyms (cont'd)



POS	:Plant Operational State
PRA	:Probabilistic Risk Assessment
RAI	:Request for Additional Information
RCP	:Reactor Coolant Pump
RCS	:Reactor Coolant System
RG	:Regulatory Guide
RHR/RHRS	:Residual Heat Removal System
RSC	:Remote Shutdown Console
RWSP	:Refueling Water Storage Pit
RVR	:Reactor Vessel Rupture
R/B	:Reactor Building
SBO	:Station Black Out
SER	:Safety Evaluation
SFP	:Spent Fuel Pit
SG	:Steam Generator
SGTR	:Steam Generator Tube Rupture
SI	:Safety Injection
SLB	:Steam Line Break
SLBI	:Steam Line Break Upstream of MSIV
SLBO	:Steam Line Break Downstream of MSIV
SLOCA	:Small Break Loss of Coolant Accident
SMA	:Seismic Margin Analysis
SPAR-H	:Standardized Plant Analysis Risk – Human Reliability Analysis
SSC	:Structure, System or Component
THERP	:Technique for Human Error Rate Prediction
TISGTR	:Temperature Induced SGTR
TS LCO	:Technical Specification Limiting Condition for Operation
T/B	:Turbine Building
T-D EFW	:Turbine Driven Emergency Feedwater
T-H	:Thermal-Hydraulic
TRANS	:Transient
VSLOCA	:Very Small LOCA

Contents of DCD Chapter 19



Section No.	Description
19.0	Probabilistic Risk Assessment and Severe Accident Evaluation
19.1	Probabilistic Risk Assessment
19.2	Severe Accident Evaluation
19.3	Open, Confirmatory, and COL Action Items Identified as Unresolved

Relationship between DCD and Topical/Technical Reports



DCD Section	Topical / Technical Reports
19.1 PRA	MUAP-07030
19.2 Severe Accident Evaluation	MUAP-07030, MUAP-08004, MUAP-10004
19.3 Open, Confirmatory, and COL Items	None

Topical Reports	None	--	--
Technical Reports	MUAP-07030 (R3)	US-APWR Probabilistic Risk Assessment	June 2011
	MUAP-08004 (R1)	US-APWR Probabilistic Risk Assessment (Level 3)	Sep. 2008
	MUAP-10004 (R0)	Additional Sensitivity Analyses for the DDT potential and the Mixing in the Containment	Mar. 2010



19.1 PRA

Introduction



- The US-APWR evolutionary design improvements will be presented and demonstrate that probabilistic safety goals are met

- Specifics of the US-APWR PRA:
 - ✓ PRA model was developed considering RG 1.200 and ASME/ANS PRA Standard RA-S-2008, RA-Sa-2009
 - ✓ Bounding assumptions were used when detailed information was not available
 - ✓ Important assumptions and risk insights are summarized in Table 19.1-119. There are COL Action items to ensure that the assumptions and risk insights are valid during as-built and construction phases.

PRA Technical Adequacy



- Documentation developed and revisions are procedurally controlled including independent review and control of documentation
- Corrective action program is in place for changes in information and errors
- Model was peer reviewed in July – September 2007
 - ✓ Internal events, flood and fire at power
 - ✓ Low Power and Shutdown
 - ✓ Level 2, LRF for internal events at power
 - ✓ PRA-based Seismic Margin Analysis
- MHI has a qualification program for PRA analysts

PRA Scope



Initiator	POS	Level 1	Level 2
Internal Event	Full Power	PRA	PRA
	LPSD	PRA	▲
Internal Flooding	Full Power	PRA	PRA
	LPSD	PRA	▲
Internal Fire	Full Power	PRA	PRA
	LPSD	PRA	▲
Seismic	Full Power	PRA-based SMA	
	LPSD		
Other External Events	Full Power	Screening approach based on ASME/ANS PRA standard criteria (Scope of COL phase)	
	LPSD		

▲ Conservative or bounding estimate of frequency

PRA Uses in Design Process



- Identify and eliminate weaknesses and vulnerabilities

- Proposed design changes to reduce plant risk
 - ✓ Alternate charging pump cooling to prevent RCP seal LOCA
 - ✓ Locked closed state for emergency letdown isolation valve (for internal fire PRA)
 - ✓ Prevention of LOOP event caused by turbine building fire (for internal fire PRA)
 - ✓ Physical barriers in ECCS pump and CCW pump room (for internal flooding PRA)

- Provide input to Reliability Assurance Program

US-APWR Special Design Features

(to reduce CDF)



- Four train safety related high head injection system with Direct Vessel Injection (DVI)
- Four train safety related electrical system with four Gas Turbine Generators (GTG) for AC power
- Elimination of the need for Low Head Safety Injection (LHSI) by use of an advanced accumulator injection system
- Elimination of recirculation switch-over by use of an in-containment Refueling Water Storage Pit (RWSP)

US-APWR Special Design Features

(to reduce CDF)



- Two alternate AC (AAC) GTGs within Seismic Category I structure
- Upgraded piping design pressure for Residual Heat Removal System (RHRS) reducing potential for Intersystem LOCA (ISLOCA)
- Four trains of Emergency Feedwater (2 motor driven, 2 steam driven)
- Alternate charging pump cooling using non-essential chilled water system or fire protection water supply system to maintain RCP seal cooling

US-APWR Special Design Features



(to reduce LRF)

- Battery powered hydrogen ignition system
- Reliable reactor cavity flooding features (ECCS, CSS, FSS)
- Reactor cavity geometry to ensure ex-vessel cooling of the core debris
- Diverse RCS depressurization valves
- Reactor cavity geometry to limit direct containment heating (DCH) following a high pressure melt ejection
- Alternate containment cooling
- Fire water injection to reactor cavity and spray header

PRA Data Sources



U.S. data sources are applied to US-APWR PRA.

- Initiating event frequency (Major data sources)
 - NUREG/CR-6928
 - NUREG/CR-5750
 - NUREG/CR-6890 (for LOOP event)

- Failure probability and rate (Major data sources)
 - NUREG/CR-6928
 - Institute of Electrical and Electronic Engineers (IEEE) Std. 500

- CCF data
 - NUREG/CR-5497

PRA Methods and Codes



- CCF Model
 - MGL Model: NUREG/CR-5485

- Human Reliability Analysis
 - ASEP: NUREG/CR-4772 (Pre- and post-initiating event)
 - THERP: NUREG/CR-1278 (Initiating event related)
 - SPAR-H: NUREG/CR-6883 (Human error dependency)

- Thermal Hydraulic Analysis Code
 - MAAP 4.0.6 for accident sequence and success criteria
 - WCOBRA/TRAC(M1.0) for verification of large break LOCA

- PRA Quantification
 - RiskSpectrum® PSA professional
 - Truncation value of 1E-15

Summary of PRA Results



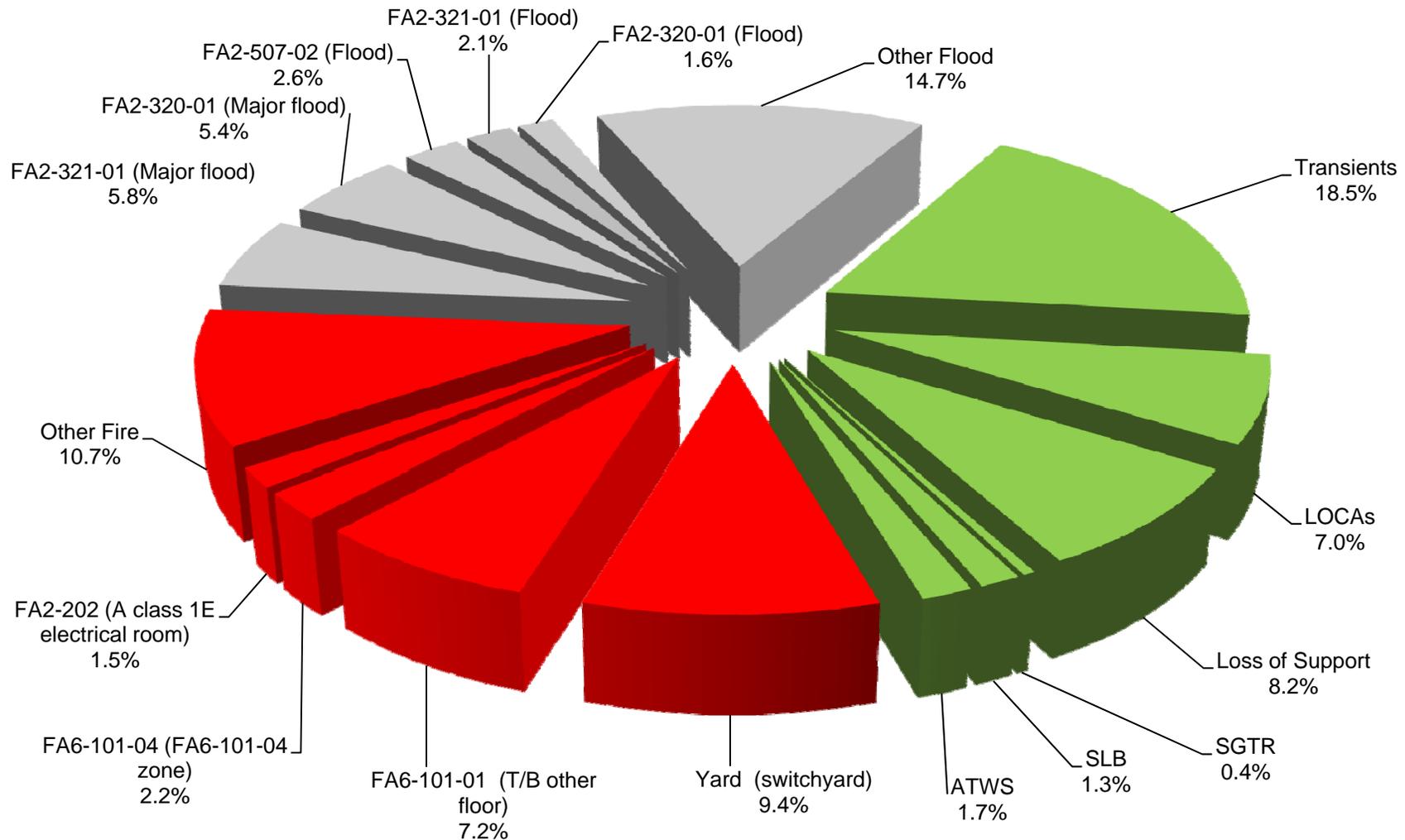
Initiator Group	CDF [1/year]	LRF [1/year]
Internal Events	1.0E-6	1.1E-7
Internal Fire	8.6E-7	1.9E-7
Internal Flood	8.9E-7	1.6E-7
Low Power and Shutdown	3.0E-7	3.0E-7
Total	3.1E-6	7.6E-7

LPSD is sum of the CDFs of internal and external (internal fire and flood)
The LRF of LPSD is conservatively assumed to be the same as the CDF.

At-Power Initiating Event Contribution



Initiator Contribution to At-Power CDF



At-Power CDF – $2.8E-6$ / yr



Internal Events PRA Summary

At-Power Internal Events



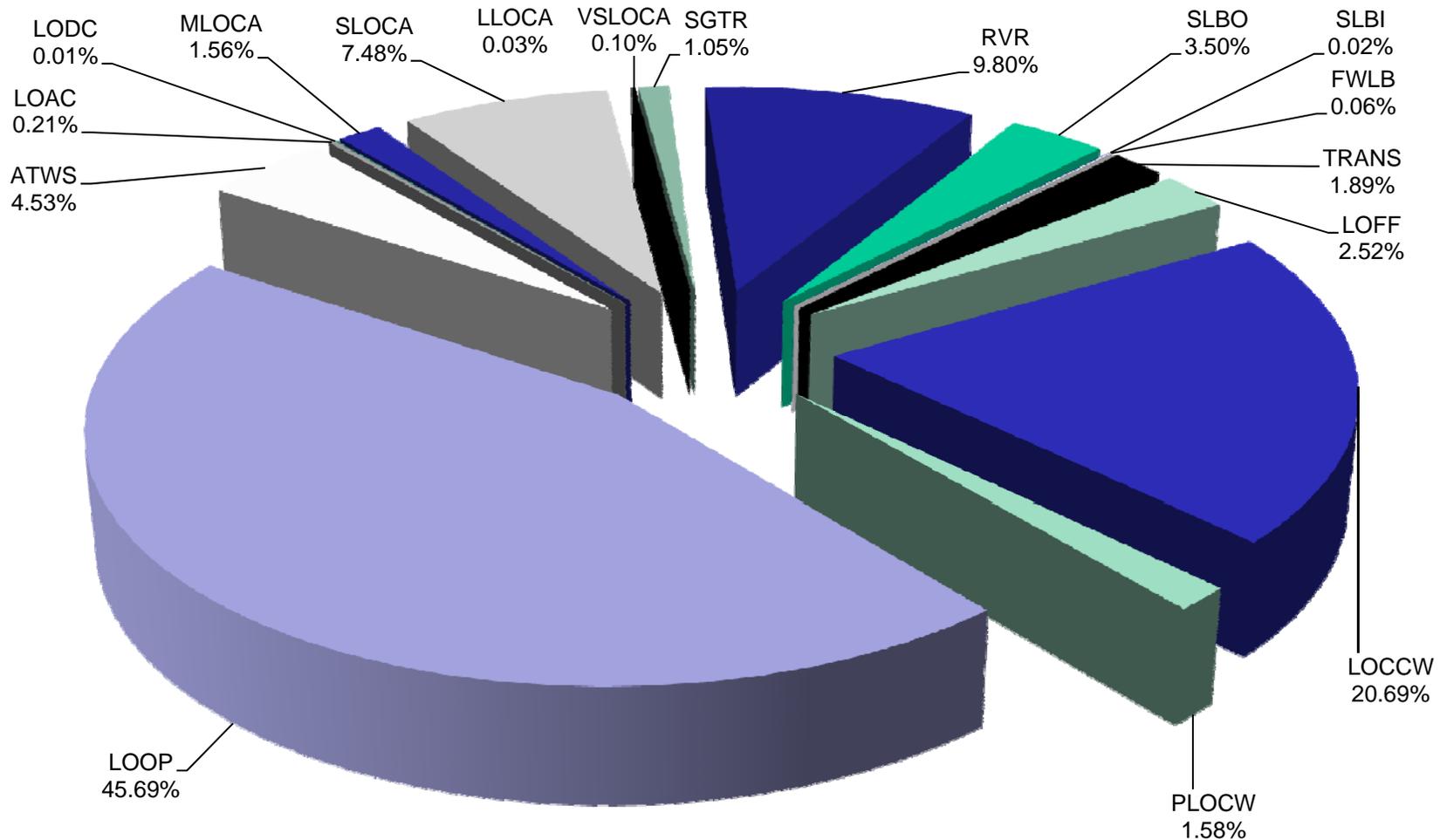
➤ Key internal event assumptions

- ✓ 480 gpm RCP Seal LOCA per pump assumed 1 hour after seal cooling and seal injection are lost
- ✓ Common Cause between the Emergency AC power system and the Alternate AC power is assumed minimal

➤ Internal event risk insights

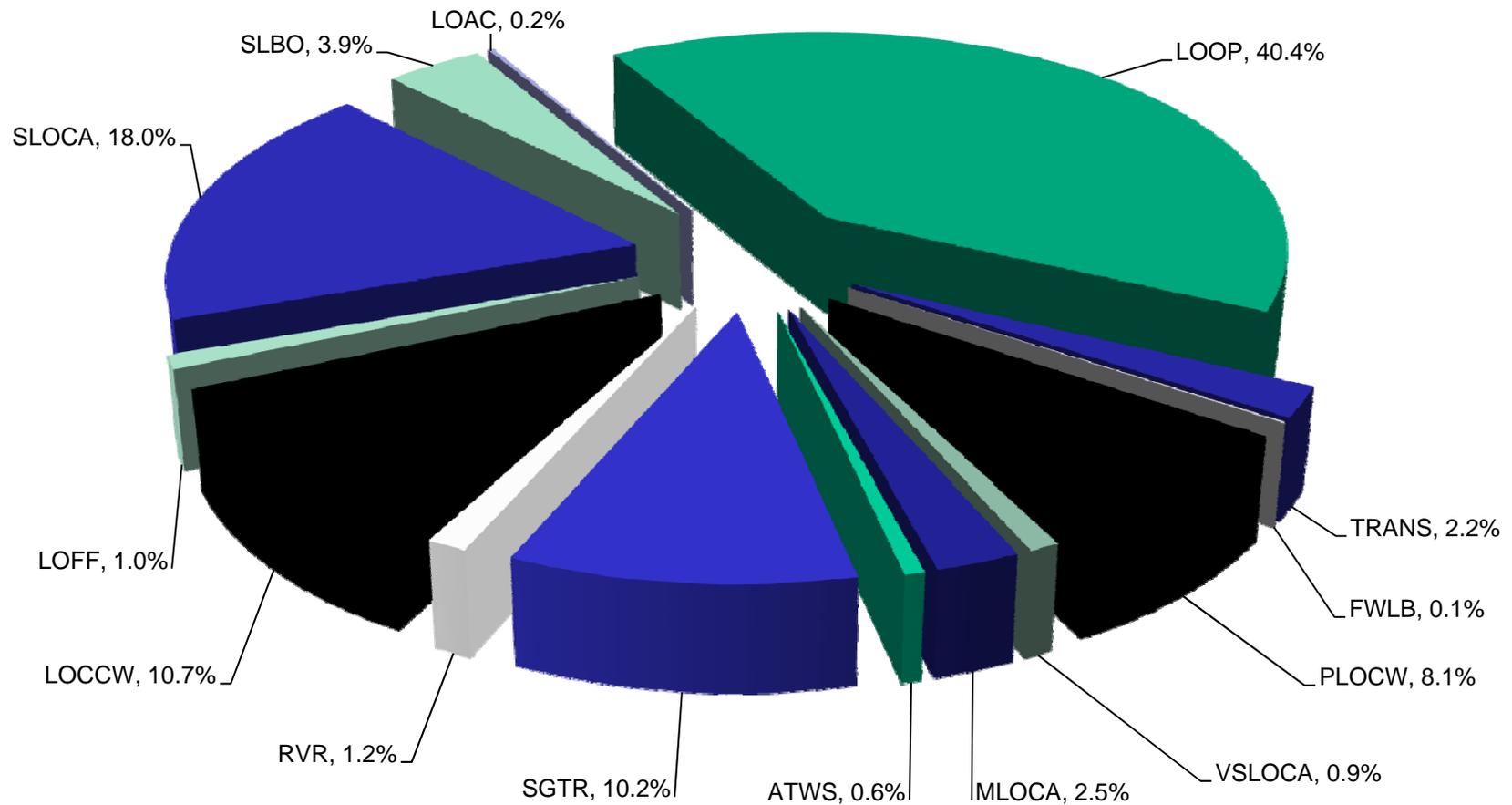
- ✓ Support systems for LOOP are important
- ✓ Component Cooling Water is important (due to seal LOCA impacts)
- ✓ CCF is important due to high redundancy (4 train)

At-Power Internal Events CDF Results



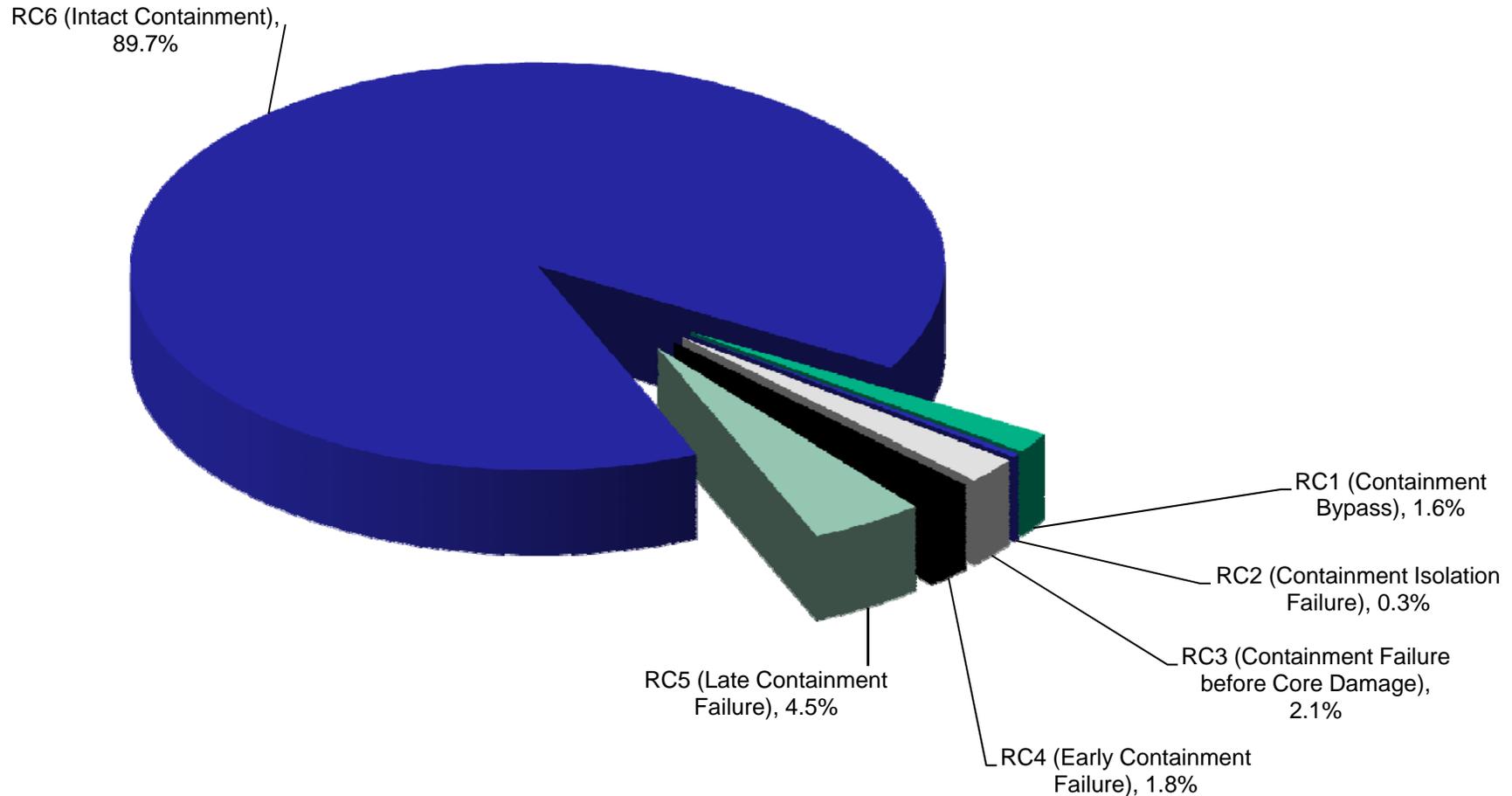
At-Power Internal Events CDF – $1.0E-6$ / yr

At-Power Internal Events LRF Results



At-Power Internal Events LRF – $1.1E-7$ / yr

At-Power Internal Events LRF Release Category Results



At-Power Internal Event Uncertainty Results



Parameter	CDF [/year]	LRF [/year]
95 th Percentile	2.9E-06	3.5E-07
Mean	1.0E-06	1.1E-07
Median	7.8E-07	8.2E-08
5 th Percentile	3.1E-07	2.6E-08

Key Sources of Uncertainty



◆ RAI Topic / NRC Concern

Identify “Key sources of uncertainty” from all PRA areas to ensure that the uncertainties are addressed in the future PRA applications

◆ MHI Response

- ✓ Identified the key sources of uncertainty and provided in DCD Table 19.1-38 (CDF) and 19.1-53 (LRF)
- ✓ Performed sensitivity analyses to study their impact on the PRA and summarized the results in DCD Table 19.1-140
- ✓ Added COL Action item to evaluate and address the key sources of uncertainty and key assumptions in DCD Table 19.1-38

Key Insights and Assumptions



◆ RAI Topic / NRC Concern

Identify “Key insights and assumptions” regarding design operational features and document in the DCD with proper dispositions

◆ MHI Response

- ✓ Identified the key insights and assumptions (e.g. design feature, operator actions) and their disposition, and documented in DCD Table 19.1-119
- ✓ Added COL Action item to ensure the key insights and assumptions are valid in as-built design and construction phase



Internal Fire PRA Summary

At-Power Internal Fire



➤ Internal fire PRA methodology

- ✓ Fire PRA methodology and fire data are based on NUREG/CR-6850

➤ Key internal fire design features

- ✓ Each of the four safety trains is segregated by a fire barrier in the reactor building (R/B)
- ✓ Turbine building electrical rooms are separated into two groups by qualified fire barriers

At-Power Internal Fire (cont'd)



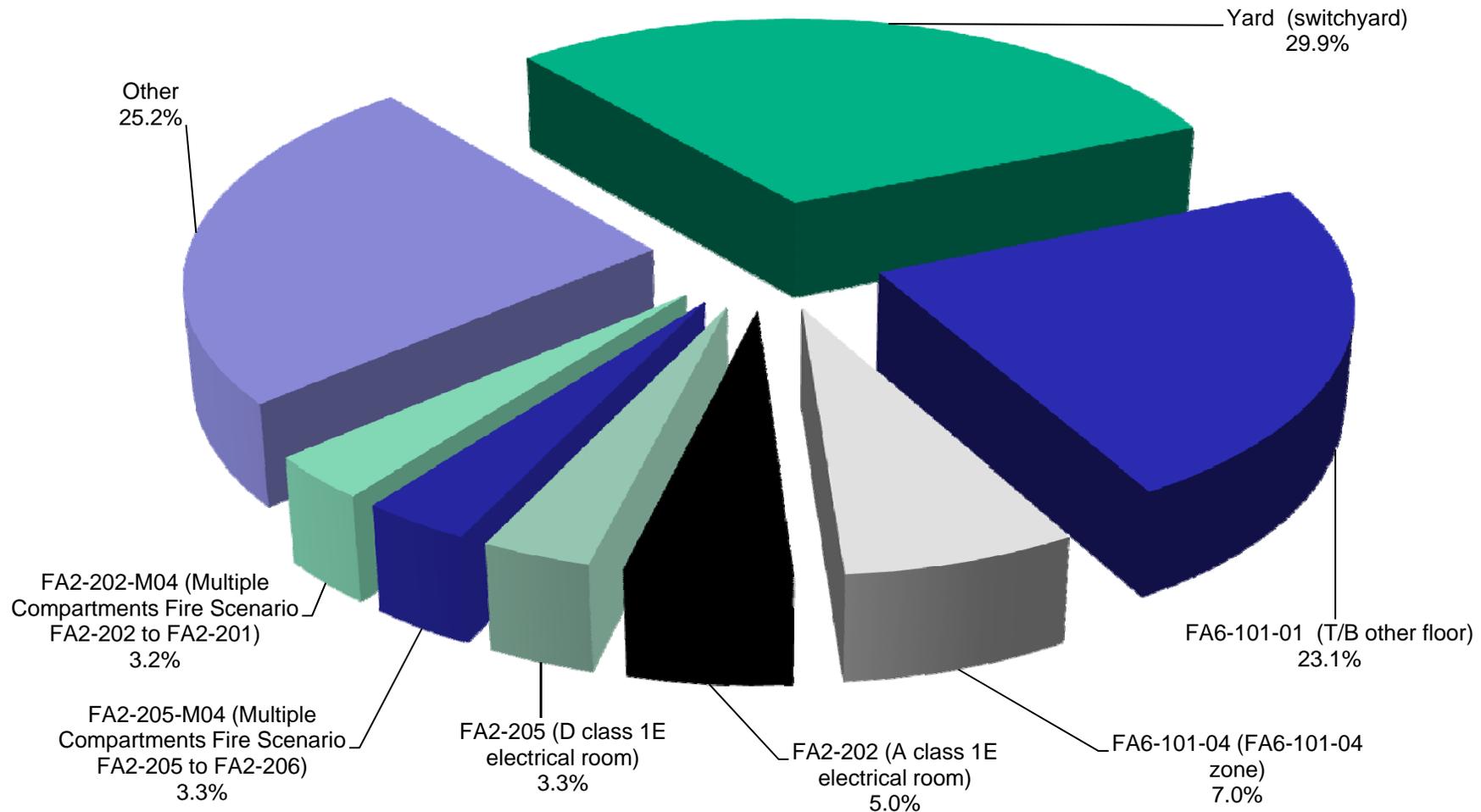
➤ Key internal fire PRA assumptions

- ✓ No credit is taken for fire detection and suppression activities

➤ Internal fire risk insights

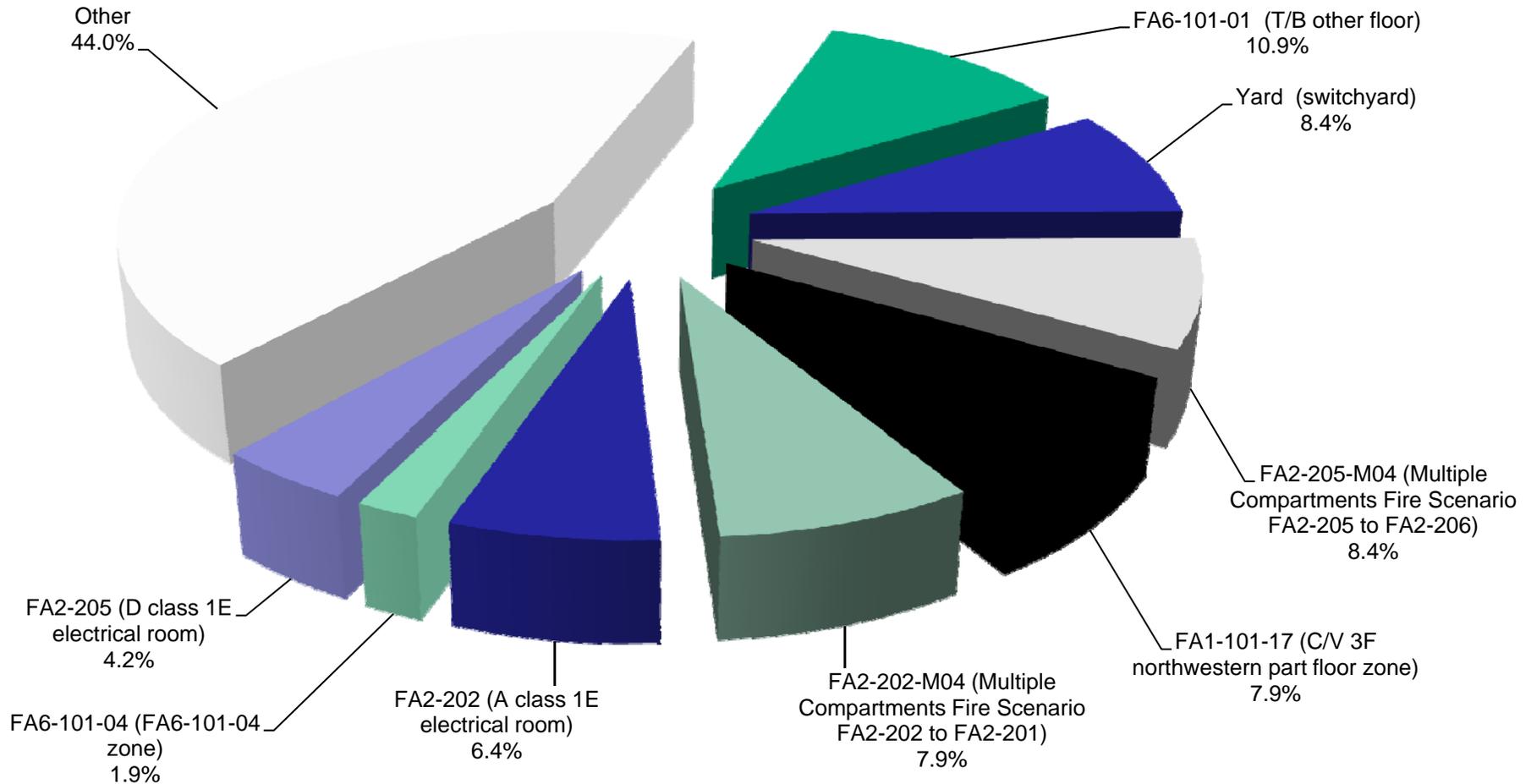
- ✓ Yard fire and turbine building fire are largest contributors to fire risk due to enhanced fire protection design features in the R/B
- ✓ Yard fire causes loss of offsite power and it results in core damage in the case of failures of four Class 1E GTGs and two AACs
- ✓ Turbine building fire causes a general transient

At-Power Internal Fire CDF Results



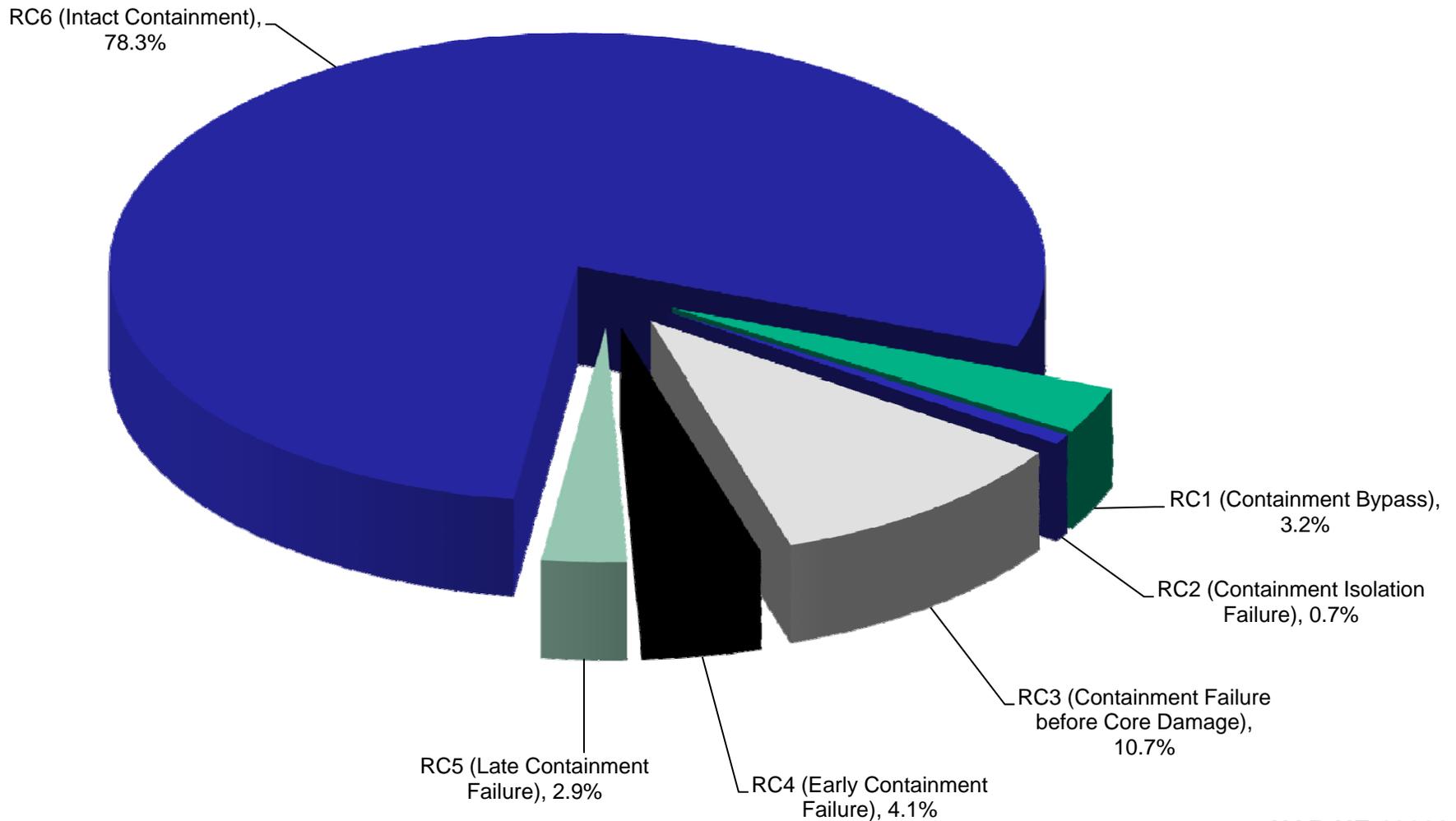
At-Power Fire CDF – $8.6E-7$ / yr

At-Power Internal Fire LRF Results



At-Power Fire LRF – $1.9E-7$ / yr

At-Power Internal Fire LRF Release Category Results



At-Power Internal Fire Uncertainty Results



Parameter	CDF [/year]	LRF [/year]
95 th Percentile	2.7E-06	5.1E-07
Mean	8.6E-07	1.9E-07
Median	6.3E-07	1.5E-07
5 th Percentile	2.1E-07	5.2E-08

Key Fire Insights and Assumptions



◆ RAI Topic / NRC Concern

- ✓ Identify and document “Key insights and assumptions” regarding internal fire in the DCD

◆ MHI Response

- ✓ Identified and summarized the internal fire key design features, insights and assumptions in DCD Table 19.1-119

➤ Main Control Room (MCR) fire

- ✓ Transfer to Remote Shutdown Console (RSC) from MCR to achieve safe shutdown



Internal Flooding PRA Summary

At-Power Internal Flooding



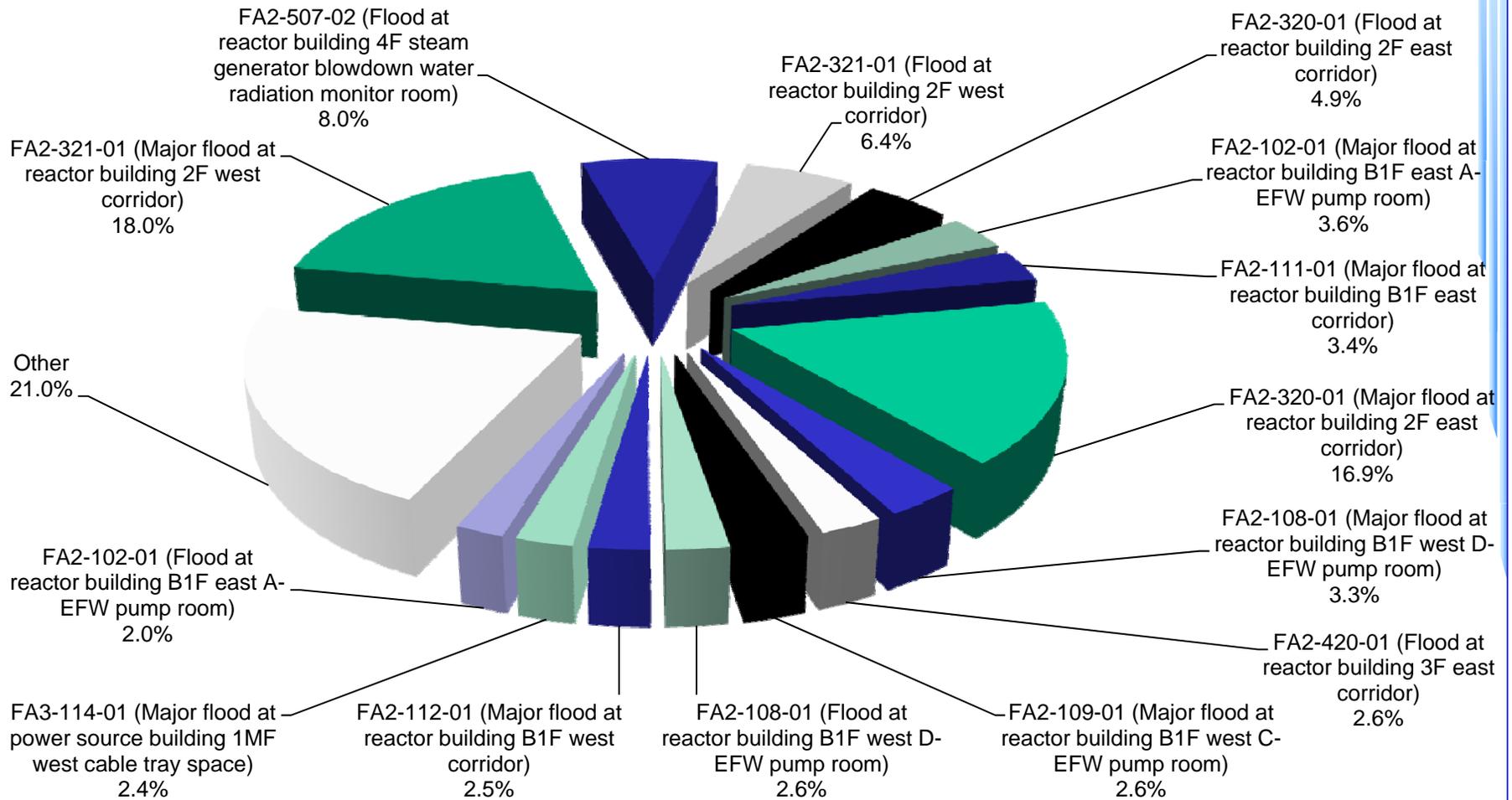
➤ Internal flooding PRA methodology

- ✓ Flooding analysis followed ASME/ANS PRA standard and NUREG/CR-2300 guidance
- ✓ Pipe rupture frequencies based on EPRI-TR-1013141 guidance
 - Flood sources: “Spray”, “Flood”, “Major Flood”

➤ Key Internal flooding design features

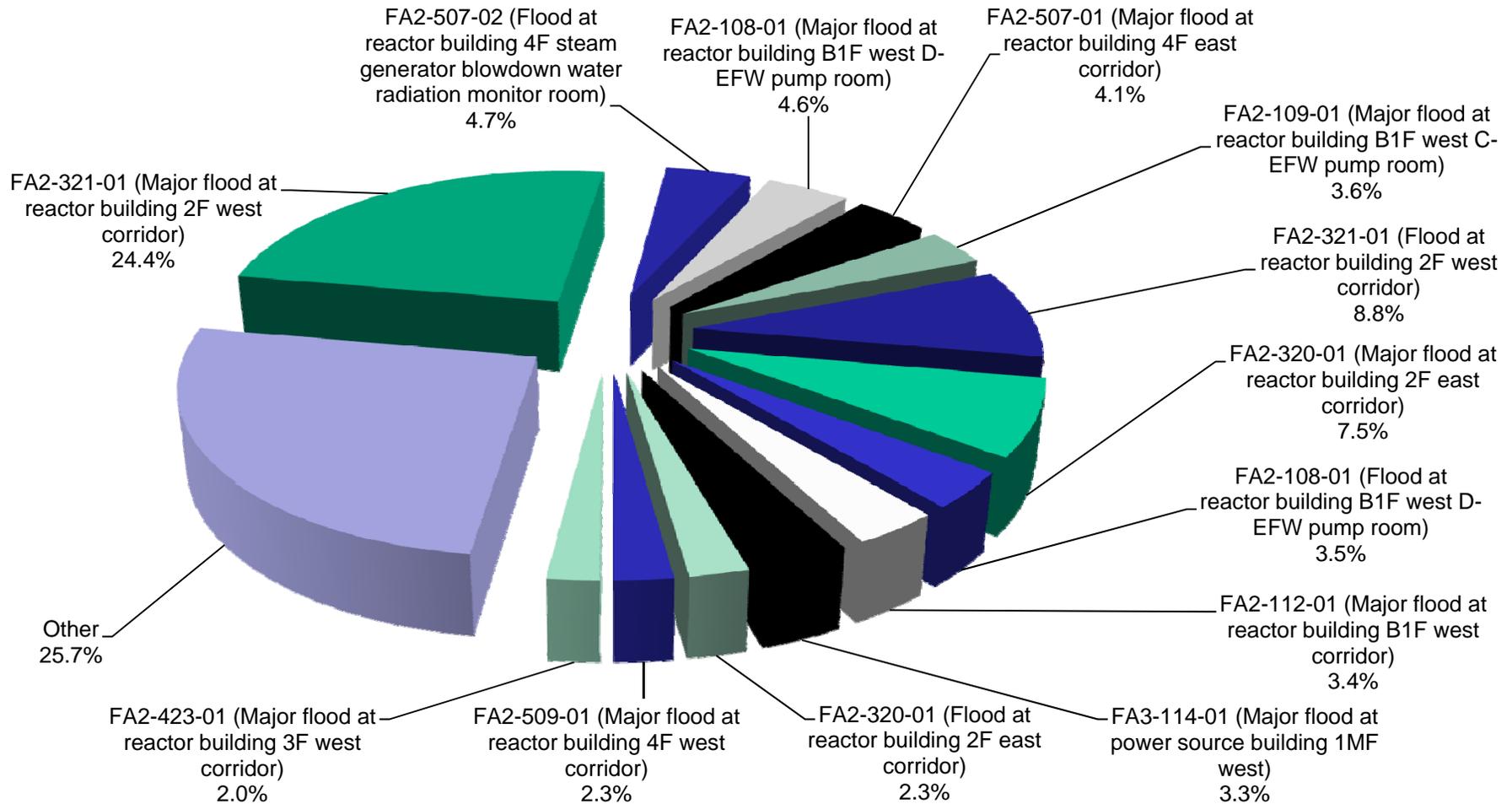
- ✓ All floors of reactor building (R/B) are divided into two separate flood divisions (East side and West side) by concrete walls and/or water tight doors
- ✓ Water tight doors for safety-related SSC areas, main control room, and Reactor Building exits
- ✓ Transfer to Remote Shutdown Console (RSC) from MCR to achieve safe shutdown

At-Power Internal Flooding CDF Results



At-Power Flooding CDF – $8.9E-7$ / yr

At-Power Internal Flooding LRF Results

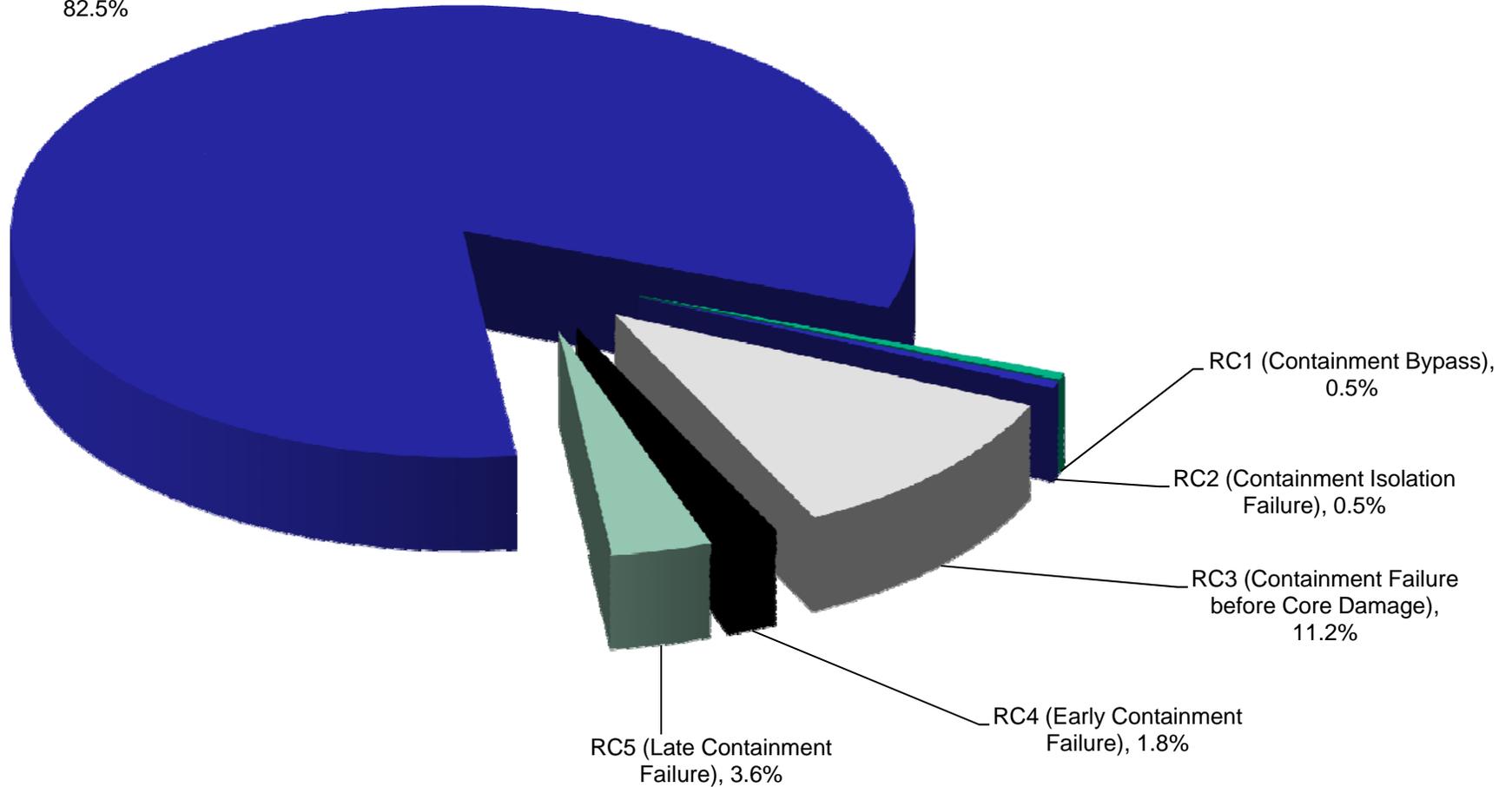


At-Power Flood LRF – $1.6E-7$ / yr

At-Power Internal Flooding LRF Release Category Results



RC6 (Intact Containment),
82.5%



At-Power Internal Flooding Uncertainty Results



Parameter	CDF [/year]	LRF [/year]
95 th Percentile	2.4E-06	3.8E-07
Mean	8.4E-07	1.5E-07
Median	5.0E-07	9.7E-08
5 th Percentile	1.4E-07	3.3E-08

Flooding Insights and Assumptions



➤ **Key internal flooding assumptions**

- ✓ The isolation of flood sources by operators outside MCR is not credited
- ✓ Flood water from ESW in CCW heat exchanger room is isolated within 15 minutes (ESW pump trip)

➤ **Internal flooding risk insights**

- ✓ Floods in either area (east or west) of the R/B contribute to internal flood risk but impact is limited because of no flood propagation to the other area
- ✓ Floods from EFW system on the second floor of either side of R/B contribute to internal flood risk but impact is limited because of no flood propagation to the other area

Flooding Insights and Assumptions (cont'd)



➤ Key internal flooding insights and assumptions

◆ RAI Topic / NRC Concern

- ✓ Identify and document “Key insights and assumptions” regarding internal flooding in the DCD

◆ MHI Response

- ✓ Identified and summarized the internal flooding key design features, insights and assumptions in DCD Table 19.1-119

➤ Pipe rupture frequencies of EPRI-1013141 used for US-APWR internal flooding PRA are updated in EPRI-1021086 in October 2010

- ✓ A sensitivity study indicated that the updated flood data will reduce internal flooding risk



Low Power / Shutdown PRA Summary

Low Power Shutdown



➤ LPSD PRA Approach

- ✓ Scope of the LPSD PRA added RHR operation to the at-power internal events PRA model to develop model for Modes 4, 5, and 6.
- ✓ Plant condition during shutdown operation is categorized into 13 POSs, and each of the POSs of mid-loop operation (POS 4 and 8) is categorized into 3 sub-POSs
- ✓ Detailed accident sequence quantification performed for POS 4-3 and POS 8-1. For other POSs, the risk is evaluated by initiating event frequency and the conditional core damage probability (CCDP) of either POS 4-3 or 8-1.

Low Power Shutdown (cont'd)



➤ Design Features to Reduce Shutdown Risk

- ✓ No penetrations are located below the top of the reactor core to minimize potential for a loss of coolant (by drain-down) from the reactor vessel
- ✓ There is an interlock for automatic isolation of the low-pressure letdown line when the RCS inventory is reduced
- ✓ Elevation of SG nozzle dams is designed to be higher than the top of main coolant piping. Due to the design, the water level during nozzle dam installation is higher than that of conventional US plants.

Low Power Shutdown (cont'd)



➤ Conformance with Recommendations of GL 88-17

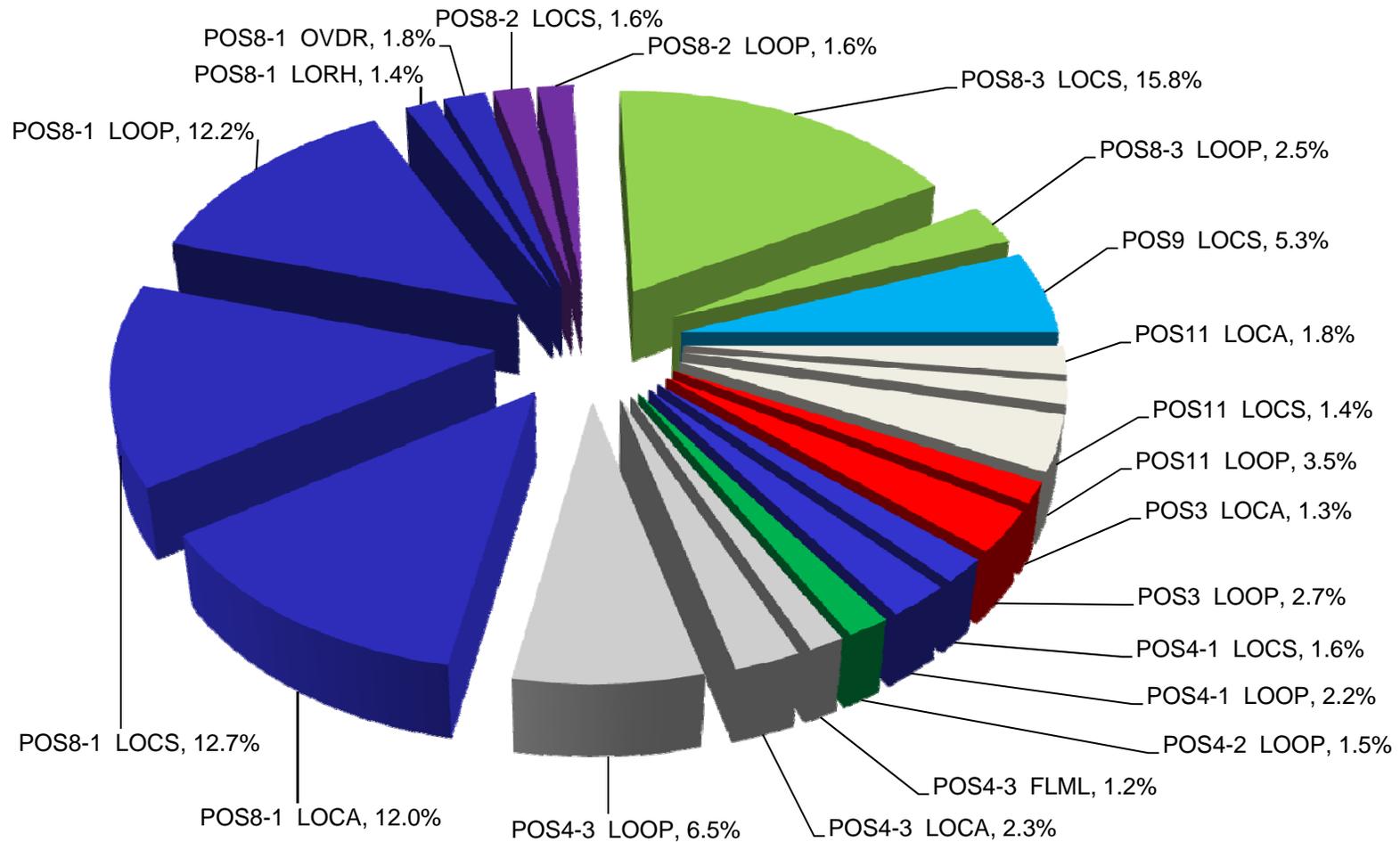
- ✓ Plant personnel calculate plant-specific time to reach 200F in the RCS and time to close the containment hatch in order to determine if the hatch is “capable of being closed” prior to reaching harsh environment in containment in the loss of RHR event. If the time to hatch closure is shorter than that to reach harsh environment, then containment is allowed to be opened

- ✓ Provide the means to add inventory in the RCS by SI pump, charging pump and gravity injection from SFP when the decay heat removal using RHR system is unavailable

LPSD Initiating Event Contribution



Initiator Contribution to LPSD CDF (IE, Fire & Flood)



Low Power Shutdown (LPSD) CDF – 3.0E-7 / yr

Low Pressure Letdown Line Vortexing



➤ CS/RHR Pump Operation in Reduced Inventory Condition

◆ RAI Topic / NRC Concern

- ✓ Provide (1) the H/L level/set point at which automatic isolation of low-pressure letdown line actuates and (2) the highest H/L level at which CS/RHR pump is damaged by air ingestion.

◆ MHI Response

- ✓ Set point for the isolation is set above the MCP.
- ✓ PRA assumption
 - RHR operation can be maintained while the RCS level is above the set point.
 - When the level is below the set point, CS/RHR pump is damaged by air ingestion.

PRA Conclusions



- US-APWR advanced design features reduce the plant risk and meet the Commission's safety goals against internal and external hazards
 - ✓ Four trains of safety related systems
 - ✓ In-containment refueling water storage pit
 - ✓ Full digital instrumentation and controls
 - ✓ Advanced accumulators
 - ✓ Each safety train is physically separated with fire protection features
 - ✓ Reactor building and power source building are separated by two divisions (east and west sides) with flood protection features

SER Open Items for PRA



Item	RAI No.	RAI Topic / NRC Concern	RAI Response / DCD Impact
1 (OI 19.1-LEVEL1-574)	750-5675 Q19-507, 750-5675 Q19-509, 834-6035 Q19-559, 898-6275 Q19-564, 967-6790 Q19-574	The list of COL action items in the DCD appears to be incomplete.	MHI committed to revise COL Action items 19.3(1) and 19.3(6) and added new COL Action item 19.3(10).
2 (OI 19.1-LEVEL1-512)	750-5675 Q19-512	The “key insights and assumptions” should include items for design and operational features in the DCD.	MHI will document the key insights and assumptions in DCD Table 19.1-119.
3 (OI 19.1-LEVEL1-513)	40-610 Q19-97&98, 423-2710 Q19-364, 750-5675 Q19-513	A systematic review to demonstrate the robustness of the assumed PRA success criteria should be performed.	MHI will perform T-H analyses to provide the basis for success criteria and summarize the results in DCD Subsection 19.1.4.1.
4 (OI 19.1-LEVEL1-514)	750-5675 Q19-514	The failure probability of the operator action to equalize primary and secondary pressures (event DEP) must be estimated and documented.	MHI will provide the T-H analysis results to demonstrate that the operator action has redundancy and sufficient allowable time and will document the results in DCD Table 19.1-119.
5 (OI 19.1-LEVEL1-515)	750-5675 Q19-515	The precise definition of I&C hardware and software CCFs modeled in the PRA should be provided.	MHI will provide additional information regarding how to model digital I&C in the PRA.

SER Open Items for PRA (cont'd)



Item	RAI No.	RAI Topic / NRC Concern	RAI Response / DCD Impact
6 (OI 19.1-LEVEL1-516)	750-5675 Q19-516	Provide the basis of the assumption made in the PRA that the time the T-D EFW pumps are capable of operating without HVAC.	MHI will provide the room temperature analysis results to show that the components can operate within mission time, regardless of room cooling.
7 (OI 19.1-LEVEL1-575)	967-6790 Q19-575	Statements in the DCD should be clarified.	MHI committed to clarify the statements in DCD Section 19.1.2.3.
8 (OI 19.1-FIRE-573)	967-6790 Q19-573	The transfer of the control of the plant from MCR to RSC should be included in DCD Table 19.1-119.	MHI committed to include the key assumption in DCD Table 19.1-119.
9 (OI 19.1-LEVEL2-560)	871-6121 Q19-560	Concerns regarding the Level 2 PRA modeling of the hydrogen control top event need to be addressed.	MHI will revise the Level 2 PRA addressing the NRC's concern. The LRF safety goal is still satisfied with this modification.
10 (OI 19.1-LPSD-546)	783-5855 Q19-546, 924-6352 Q19-570, 983-6953 Q19-579	The impact on LPSD risk should a COL applicant decide to drain the RCS in POS 4-1 with the RCS open should be determined.	MHI committed to provide the sensitivity analysis assuming no SG cooling is available during drain down (POS 4-1) and document it in DCD Subsection 19.1.6.2.

SER Open Items for PRA (cont'd)



Item	RAI No.	RAI Topic / NRC Concern	RAI Response / DCD Impact
11 (OI 19.1-LPSD-565)	899-6281 Q19-565	The omission of LOCAs during POSs 5, 6, and 7 from the LPSD PRA should be addressed.	MHI committed to document the reasons why risk during the POSs is considered insignificant in DCD Subsection 19.1.6.1.
12 (OI 19.1-LPSD-506)	749-5651 Q19-506, 983-6953 Q19-578	The failure of the SG nozzle dams due to a postulated RCS re-pressurization and RCS venting during nozzle dam installation should be addressed.	MHI committed to document the need for operational procedure during mid-loop in DCD Chapter 5 and Table 19.1-119.
13 (OI 19.1-LPSD-495)	681-5257 Q19-495	The auto-isolation function of RCS letdown on low hot-leg level and prevention of vortexes in the hot-leg should be justified.	This open item is now being discussed as part of related Chapter 5 RAIs.
14 (OI 19.1-LPSD-568)	899-6281 Q19-568	Concerns with instrumentation for auto and manual isolation of letdown which impacts over-drain (OVDR) and failure to maintain level (FLML) frequency should be addressed.	MHI committed to provide the interlock information and the related design description in the DCD.
15 (OI 19.1-LPSD-494)	669-5219 Q19-494	The need for Technical Specifications rather than voluntary initiatives should be addressed.	MHI will evaluate TS LCO modifications to address the concern.

SER Open Items for PRA (cont'd)



Item	RAI No.	RAI Topic / NRC Concern	RAI Response / DCD Impact
16 (OI 19.1-LPSD-567)	899-6281 Q19-567	The lack of automation for standby RCS injection should be addressed.	MHI provided justification for not having automated standby RCS injection.
17 (OI 19.1-LPSD-570)	924-6352 Q19-570	Key sources of uncertainty and key assumptions should be documented.	MHI committed to document key sources of uncertainty and key assumptions in the DCD, with qualitative and quantitative assessment results.
18 (OI 19.1-LPSD-566)	899-6281 Q19-566	The information requested on containment closure and consistency with GL 88-17 should be provided.	COL applicant will be required to evaluate and demonstrate the capability to close containment prior to RCS boiling after a loss of RHR, which was documented in DCD Table 19.1-119.
19 (OI 19.1-LPSD-66)	39-548 Q19-66, 983-6953 Q19-577	Risk insights regarding the design description of the reactor vessel (there is no penetration path at the bottom of the vessel) should be added to the LPSD PRA.	MHI committed to update Table 19.1-119 of the DCD.



19.2 Severe Accident Evaluation

Severe Accident Evaluation (Prevention)



➤ ATWS

- ✓ Four train safety grade reactor protection system
- ✓ Diverse actuation system

➤ Mid-Loop operations

- ✓ Four train RHR design
- ✓ Drain down path interlocked with water level

➤ SBO

- ✓ Four train Class 1E power sources, and
- ✓ Two alternate AC sources

➤ Fire

- ✓ Four trains of safety systems are physically separated

➤ ISLOCA

- ✓ RHR designed not to fail by over-pressure

Severe Accident Phenomena and LRF



➤ Evaluation of Severe Accident Phenomena Effect on the LRF

✓ Temperature Induced SGTR (TISGTR)

- Evaluated based on the latest understanding about the occurrence of TISGTR
- Revised probability of TISGTR for LRF

✓ Ex-Vessel Steam Explosion

- Considered large range of uncertainties for evaluation of Ex-Vessel Steam Explosion
- Assessed the sensitivity of Ex-Vessel Steam Explosion for LRF

✓ Hydrogen burning

- Evaluated the hydrogen burning in the RWSP in SBO with loss of AAC which may cause the increase in LRF
- Adopted battery powered hydrogen ignition system

Severe Accident Evaluation (Mitigation)



- **Hydrogen Generation and Control**
 - ✓ Battery powered hydrogen igniters
 - ✓ Large volume containment

- **Core Debris Coolability (MCCI)**
 - ✓ Diverse reactor cavity flooding systems
 - ✓ Reactor cavity geometry and floor area

- **High Pressure Melt Ejection**
 - ✓ Safety depressurization valves
 - ✓ Severe accident dedicated depressurization valves
 - ✓ Reactor cavity debris trap (DCH)

Severe Accident Evaluation (Mitigation)



➤ Steam Explosion

- ✓ In-vessel steam explosion (negligible – NUREG-1524)
- ✓ Ex-vessel steam explosion (containment structural capacity sufficient to withstand)

➤ Temperature-Induced SGTR

- ✓ Safety depressurization valves

➤ Long Term Containment Overpressure

- ✓ Diverse injection sources to spray header
- ✓ Alternate containment cooling

Potential Design Improvements



- No additional design alternatives were shown to be cost beneficial in severe accident mitigation design

SER Open Items for Severe Accident Evaluation



Item	RAI No.	RAI Topic / NRC Concern	RAI Response / DCD Impact
1 (OI 19.2-SER-569)	924-6352 Q19-569 983-6953 Q19-580	The severe accident design features and their survivability for a severe accident during shutdown conditions need to be clarified.	MHI will provide reasonable assurance for the severe accident design features during shutdown conditions, including the survivability evaluation.