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

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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586TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FRIDAY

SEPTEMBER 9, 2011

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear
Regulatory Commission, Two White Flint North,
Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Said
Abdel-Khalik, Chairman, presiding.

COMMITTEE MEMBERS:

- SAID ABDEL-KHALIK, Chairman
- J. SAM ARMIJO, Vice Chairman
- JOHN W. STETKAR, Member-at-Large
- SANJOY BANERJEE, Member
- DENNIS C. BLEY, Member
- CHARLES H. BROWN, JR., Member
- MICHAEL L. CORRADINI, Member
- DANA A. POWERS, Member

1 COMMITTEE MEMBERS (Cont'd) :

2 HAROLD B. RAY, Member

3 JOY REMPE, Member

4 MICHAEL T. RYAN, Member

5 WILLIAM J. SHACK, Member

6 JOHN D. SIEBER, Member

7 GORDON R. SKILLMAN, Member

8

9 NRC STAFF PRESENT:

10 EDWIN M. HACKETT, Executive Director, ACRS

11 ILKA BERRIOS, Designated Federal Official

12 JEFF CIOCCO

13 HOSSEIN HAMZEHEE

14 JOHN SEGALA

15 ANGELO STUBBS

16

17 ALSO PRESENT:

18 UCHIDA SAMAMOTO, MNES

19 ATSUSHI KUMAKI, MHI

20 SHINJI KAWANAGO, MNES

21 C. KEITH PAULSON, MNES

22 RYAN SPRENGEL, MNES

23 ATO SHIKAKA, MNES

24

25

C-O-N-T-E-N-T-S

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

(8:29 a.m.)

CHAIRMAN ABDEL-KHALIK: The meeting will now come to order.

This is the second day of the 586th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting, the Committee will consider the following: 1) selected chapters of the safety evaluation report with open items associated with the U.S. advanced pressurized water reactor design certification and the Comanche Peak combined license application; 2) future ACRS activities/report of the Planning and Procedures Subcommittee; 3) reconciliation of ACRS comments and recommendations; 4) draft report on the biennial ACRS review of the NRC safety research program; 5) assessment of the quality of selected NRC research projects; and 6) preparation of ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Ms. Ilka Berrios is the designated federal official for the initial portion of the meeting.

Portions of the session dealing with the

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1 selected chapters of the SER with open items
2 associated with the U.S. advanced pressurized water
3 reactor design certification and the Comanche Peak
4 combined license application may be closed in order to
5 protect information designated as proprietary by MHI
6 and Luminant.

7 We have received no written comments or
8 requests for time to make oral statements from members
9 of the public regarding today's sessions.

10 There will be a phone bridge line. To
11 preclude interruption of the meeting, the phone will
12 be placed in a listen-only mode during the
13 presentations and Committee discussion.

14 A transcript of portions of the meeting is
15 being kept, and it is requested that the speakers use
16 one of the microphones, identify themselves, and speak
17 with sufficient clarity and volume, so that they can
18 be readily heard.

19 We will now go to the first item on the
20 agenda -- selected chapters of the SERs -- of the SER
21 with open items associated with the US-APWR design
22 certification and the Comanche Peak COLA.

23 John Stetkar will lead us through that
24 discussion.

25 MEMBER-AT-LARGE STETKAR: Thank you, Mr.

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1 Chairman. First, as a preface, the subject of this
2 presentation and our letter, if we decide to write
3 one, will be limited to only the design certification.
4 I'll explain that in a moment.

5 As we have been doing with other design
6 centers, we have established a review process for the
7 US-APWR where we are reviewing individual chapters of
8 the SER as they become available in a -- first in a
9 draft stage of the SER with open items, and then later
10 when the final SER chapters are available at some time
11 after the open items are closed out.

12 That gives us an opportunity to get some
13 preliminary information about particular technical
14 issues that might be of concern either to the staff or
15 that might raise concerns on our part, gives us a
16 chance to have some early feedback, both to the staff
17 and to MHI if we have particular issues that we raise
18 questions about or feel that we need additional
19 information.

20 And it has been working quite well. The
21 purpose of this meeting and, as I said, our letter, if
22 we decide to write one, is basically to give staff an
23 interim update on where we stand during the review
24 process. We have done that with some of the other
25 design centers.

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1 The way we are trying to run this one is
2 that unless we identify any very significant issues
3 that we feel merit immediate attention, I'm trying to
4 collect chapters into groups, so that we don't have a
5 large number of these interim letters.

6 And this is the first of those groups,
7 and, in particular, we are going to cover this morning
8 Chapters 2, which are site characteristics; 5, reactor
9 coolant and connecting systems; 8, electric power; 10,
10 steam and power conversion; 11, radioactive waste
11 management; 12, radiation protection; 13, conduct of
12 operations; and 16, technical specifications.

13 We will not have presentations on each of
14 these chapters. It is, obviously, too large a list of
15 things to cover. I have asked MHI and the staff to
16 highlight any significant technical issues based on
17 their reviews that they feel are appropriate to brief
18 the Committee on.

19 I would ask Committee members, certainly
20 members of the Subcommittee who have attended some, if
21 not all, of the meetings, if you do have specific
22 questions about focused technical issues that you
23 would like to bring to the attention of the rest of
24 the Committee and get on the record for this meeting,
25 please feel free to do that. I know MHI and the staff

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1 are prepared to answer questions beyond the material
2 that they have prepared in their presentations.

3 And with that introduction to kind of give
4 the Committee members an overview of what we are up
5 to, I guess I will turn it over to Hossein or Jeff.

6 MR. CIOCCO: Yes. Good morning. My name
7 is Jeff Ciocco. I'm the lead project manager in the
8 Office of New Reactors for the US-APWR design
9 certification. I will be giving our presentation this
10 morning.

11 However, the real people who do the work
12 on this are the NRO and the NSIR scientists and
13 engineers, many of whom are in the stands behind us.
14 Some are on the phone, and many are back at their
15 desks working as well.

16 So I'm going to give the overview
17 presentation for the NRC. The one person that I will
18 introduce is my branch chief sitting next to me here
19 is Hossein Hamzehee, also in the Office of New
20 Reactors in our US-APWR Projects Branch.

21 Thank you.

22 MEMBER-AT-LARGE STETKAR: Thanks, Jeff.

23 And with that, we will turn it over to
24 MHI.

25 MR. KUMAKI: Good morning. My name is

1 Atsushi Kumaki from Mitsubishi Heavy Industries. It
2 is a pleasure to attend this Committee meeting.

3 I am the project manager of the US-APWR
4 design certification on Mitsubishi. Since MHI, we had
5 submitted our DC application of US-APWR on December
6 2007, after that NRC reviewed and also issued SER with
7 open item for these chapters -- 2, 5, 8, 10, 11, 12,
8 13, and 16.

9 And also, the SERS Subcommittee members
10 reviewed the SER, and we had I think five times a
11 meeting with Subcommittee so far.

12 And today I appreciate that we have a full
13 Committee meeting for those chapters, and I would like
14 to present our outline of those chapters.

15 As an introduction, our US-APWR, its basic
16 design concept is same as the conventional four loops
17 PWR plant. However, there are some unique features
18 for our plant, and we selected these three items.

19 First one is advanced accumulator.
20 Normally, a conventional plant has same accumulator,
21 but our accumulator has another function. It is in
22 place of the low head injection, so our advanced
23 accumulator has a function for low head injection, so
24 that we don't have any low head injection pumps.

25 We have much -- many discussions for this

1 item, but we would like to explain about these
2 features in future discussion Chapter 6. So we don't
3 have this chapter today.

4 And second is digital I&C platform. We
5 applied for this our system, for our I&C system, and
6 also we would like to explain this feature in future
7 discussion on Chapter 7.

8 Third one, last one, is emergency gas
9 turbine generator. We applied this gas turbine
10 generator for our emergency power source. This
11 feature is described in Chapter 8, so we have
12 Chapter 8 today. So later we will explain more detail
13 for this gas turbine generator.

14 So I would like to start from Chapter 2.
15 The title is the Site Characteristics. This chapter
16 includes the geological, seismological, hydrological,
17 and meteorological parameters. Basically, those
18 parameters are applied for our standard design of the
19 US-APWR. But in actual plant, a COL applicant should
20 confirm their site characteristics are bounded or
21 provide site-specific qualification.

22 And we -- NRC reviewed this chapter, and
23 we exchanged many RAIs with NRC. And that SER has
24 some open items, but after that, right now, we close
25 all open items and we responded to all RAIs. So at

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1 this moment, there is no issue to be discussed.

2 Next is Chapter 5, Reactor Coolant and
3 Connecting Systems. This chapter addressed the
4 integrity of the reactor coolant pressure boundary,
5 which consists of the reactor vessel and the four
6 reactor coolant pumps and four steam generators and
7 their subsystems, such as RHR system, and so on.

8 And also, this chapter has no issue to be
9 discussed. Yes?

10 MEMBER-AT-LARGE STETKAR: Have you and the
11 staff resolved all of the questions about integrity of
12 the reactor coolant pump seals during station blackout
13 conditions? I know we had some discussions during the
14 Subcommittee meeting about justification for the
15 timing or amount of seal leakage if there was no
16 cooling for the reactor coolant pump seals. And that
17 could occur either during a station blackout or during
18 failures of -- for example, failure of component
19 cooling.

20 Have you resolved all of the questions
21 with the staff on those issues?

22 MR. KUMAKI: Yes. MHI already submit our
23 response to NRC.

24 MEMBER-AT-LARGE STETKAR: Okay.

25 MR. KUMAKI: And they right now may be

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1 under discussions.

2 MEMBER-AT-LARGE STETKAR: Okay. Okay.

3 Thank you.

4 MR. KUMAKI: The next is Chapter 8. The
5 title is Electric Power. This chapter includes
6 offsite power system and onsite power system, AC power
7 system, DC power system, and especially described
8 about the station blackout.

9 This chapter has Class 1E gas turbine
10 generators. We applied this generator for the
11 emergency power source.

12 And the next slide is a small explanation
13 about the gas turbine generator.

14 Left side is a picture of the -- our
15 prototype generators, and our specification for this
16 generator, the code class is 1E and the seismic
17 category is one, rated output is 4,500 kilowatts.

18 The starting is less than 40 seconds,
19 which is bounded by 100 seconds using for the safety
20 analysis assumption. Starting system is air, and we
21 performed qualification tests including initial type
22 tests and the seismic tests based on the IEEE
23 standards.

24 This slide describes our -- about the --
25 some kind of tests and RAIs. Also, qualification

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1 tests, we performed initial type tests from September
2 through December 2010, last year. We performed the
3 load capability test, start and load acceptance test,
4 and the margin test.

5 Those test rests are shown in the -- our
6 technical report MUAP-10023. Initial type test
7 results is already shown in Revision 1 of this
8 technical report, which is -- at the beginning of this
9 year we submitted.

10 And next is a seismic test of a turbine
11 engine. We performed this test from March to April of
12 2011, this year. Testing consists of 5 OBE and -- OBE
13 meaning operational base earthquake -- and the two
14 safe shutdown earthquake tests using the DCD required
15 response spectra.

16 MEMBER SHACK: Have you submitted R2 yet?
17 I only have R1. I'm just -- am I behind on the
18 technical report?

19 MR. SPRENGEL: This is Ryan Sprengel. We
20 just submitted that the end of August, so that should
21 be -- is being processed now.

22 MR. CIOCCO: That's correct. This is Jeff
23 Ciocco with the NRC, and we just received it a couple
24 days ago, so it's being processed right now.

25 MR. KUMAKI: So this technical report

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1 Revision 2 has been submitted end of August.

2 MEMBER SHACK: How will you be planning to
3 demonstrate seismic margin for the gas turbine? Will
4 that be by test or by analysis?

5 MR. KUMAKI: We perform the actual
6 shaker --

7 MEMBER SHACK: Yes, but that's for SSC.
8 Now, you are --

9 MR. KUMAKI: Yes.

10 MEMBER SHACK: -- going to have to
11 demonstrate a seismic margin.

12 MR. KUMAKI: Okay. I would like to ask
13 our engineer.

14 MR. KAWANAGO: It's basically the seismic
15 margin now for the gas turbine generator itself, and
16 we -- and we have the plant to have done some kind of
17 calculation of --

18 MEMBER CORRADINI: Analysis?

19 MR. KAWANAGO: Analysis, yes.

20 MR. KUMAKI: And then, next is major RAIs.
21 We received RAIs from NRC. Basically, those RAIs are
22 categorized by two -- reliability and diversity.

23 As for the reliability, we have reported
24 reliability of variation details in the -- our
25 technical report Revision 2. And also, diversity for

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1 these items, we have committed to use different
2 manufacturers for the Class 1 gas turbine and the
3 alternate AC gas turbine generators.

4 MEMBER-AT-LARGE STETKAR: We had -- for
5 the benefit of the members, they are also using
6 smaller, different rated gas turbine generators for
7 their station blackout alternate AC power supplies.
8 So this plant does not have any diesel generators, and
9 there have been substantial discussions between the
10 staff and MHI regarding gas turbines, because I think
11 this is the first application that we will see in the
12 United States that uses strictly gas turbines for all
13 emergency and station blackout power supplies. So
14 it's a new design concept, if you will.

15 I was going to ask you, we also had
16 substantial discussions about reliability estimates
17 for the gas turbine generators. And I know you have
18 done the testing, and we had a fairly extensive
19 briefing on the testing.

20 There were still some open questions about
21 what is defined as a gas turbine generator and what is
22 included in the scope of the reliability, in
23 particular, when comparisons are made between what is
24 defined as a gas turbine generator for the purpose of
25 these reliability estimates and what is defined as a

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1 diesel generator for comparative reliability
2 estimates.

3 The scopes seem to be different. In
4 particular, the scope of the data for diesel
5 generators typically includes failures of the starting
6 signals and failures of the output breaker from the
7 generator, and the reliability data that you've been
8 presenting for the gas turbine generators exclude
9 those two peripheral pieces of equipment, which can in
10 fact add numerical value.

11 So have you gone back yet, and are you
12 revising the reliability estimates to -- when you make
13 the comparisons with emergency diesel generator
14 reliability, are you in the process of getting that
15 potential discrepancy between the scope of where you
16 draw the boundaries around pieces of equipment
17 resolved?

18 MR. KUMAKI: Should we talk about the PRA
19 assumption?

20 MEMBER-AT-LARGE STETKAR: It's not really
21 a PRA assumption, because it's in the context of the
22 reliability. Several questions have been asked by the
23 staff, and by our Subcommittee members, regarding
24 comparative reliability of gas turbine generators with
25 emergency diesel generators, because in the U.S. there

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1 is a fairly good database on reliability of emergency
2 diesel generators.

3 There is variability, of course, from
4 plant to plant and manufacturer to manufacturer, but
5 fairly decent data. And some of the justification for
6 the use of gas turbine generators has been made based
7 on their relative reliability compared to emergency
8 diesel generators.

9 So in that context, not in PRA context but
10 in the context of gaining assurance about the use of
11 this type of machine compared to a diesel generator,
12 it's important to understand if we are comparing
13 reliability of X and Y that the scope of what is
14 included in the boundaries for X and Y are both
15 consistent.

16 So I think during our Subcommittee
17 meetings we had some questions about that issue, and
18 I was curious about where that discussion stands at
19 the moment.

20 MR. KAWANAGO: Yes. And we understand
21 well your question, and, of course, we would like to
22 answer it. We don't yet draft a response to the NRC
23 and staff on this question. And, however, the main
24 discussion point is the scope of that. And, as you
25 said, it's a emergency power supply system, especially

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1 the NUREG-6928. This one is clearly stated. It is
2 emergency diesel generator's boundary includes output
3 breaker.

4 We checked its intent should be, so that
5 content -- so main difference now of our reliability
6 data and scope is mainly only this -- only that --

7 MEMBER-AT-LARGE STETKAR: Okay.

8 MR. KAWANAGO: -- it is out of breaker.

9 MEMBER-AT-LARGE STETKAR: Okay.

10 MR. KAWANAGO: And our calculation is out
11 of the -- in a gas turbine generator, and basically
12 the 3.5 and a 10^{-4} . It's order is 10^{-4} . And diesel
13 generator and NUREG data is .053 times 10^{-3} . So we
14 explain to you, and it's gas turbine generator, and
15 it's -- and the reliability for diesel -- one order is
16 lower than diesel generator.

17 MEMBER-AT-LARGE STETKAR: On the other
18 hand, if the output breaker has --

19 MR. KAWANAGO: Yes. Sure, sure.

20 MEMBER-AT-LARGE STETKAR: -- an
21 unreliability of two times 10^{-3} , you would actually be
22 much closer.

23 MR. KAWANAGO: Yes, yes. So I think it's
24 what we have tried to say, and in our PRA and PRA
25 model has, -- not only for the diesel generator or gas

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1 turbine generator but also the -- an output breaker,
2 our PRA's model, it's a gas turbine generator, also
3 the output breaker.

4 MEMBER-AT-LARGE STETKAR: Separately,
5 okay.

6 MR. KAWANAGO: And also -- and when we see
7 actually the data of the output breaker, it is
8 typically the IEEE and Standard 500, it's four times
9 -- four times 10^{-4} . So the --

10 MEMBER-AT-LARGE STETKAR: Don't use that
11 reference.

12 MR. KAWANAGO: No.

13 (Laughter.)

14 So that basically the -- basically, what
15 we would like to answer to you, in the near future,
16 and even we -- we added the reliability of the output
17 breaker. But, still, the reliability is a good --

18 MEMBER-AT-LARGE STETKAR: Okay.

19 MR. KAWANAGO: That is our current -- it's
20 an idea to answer to.

21 MEMBER-AT-LARGE STETKAR: Thank you. That
22 helps.

23 MEMBER BROWN: Could I ask a question?

24 MEMBER-AT-LARGE STETKAR: Yes. We're fine
25 for time here. We've got the whole -- this is -- you

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1 know, the purpose is to give --

2 MEMBER BROWN: I can't remember whether I
3 asked this question or not in the Subcommittee
4 meeting, so I thought I would repeat myself.

5 MEMBER-AT-LARGE STETKAR: -- input.

6 MEMBER BROWN: These are air start, as
7 most gas turbines are. And you've got an air
8 receiver, and it's got a certain capacity -- 1,250
9 gallons, or something like that, according to your
10 document. How many starts can you run -- is it one
11 air receiver for gas turbine, or is it one air
12 receiver for all of them?

13 MR. KAWANAGO: Basically, our design is
14 each plant -- each plant has its dedicated air
15 receiver.

16 MEMBER BROWN: Okay.

17 MR. KAWANAGO: Okay? That is completely
18 independent system.

19 MEMBER BROWN: Okay. How many starts can
20 you do without recharging?

21 MR. KAWANAGO: Without recharging, it's
22 one gas turbine engine that can start just three
23 times.

24 MEMBER BROWN: Three times, okay.

25 MEMBER SIEBER: It's a package unit,

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1 right?

2 VICE CHAIRMAN ARMIJO: I had a question,
3 just for clarification. What is the difference
4 between the 1E gas turbine generators and the AACs?
5 I don't understand that.

6 MR. KAWANAGO: Its meaning -- AAC is
7 alternate AC power source. It's mainly we will use
8 for the -- in a station blackout, in the case of a
9 station blackout.

10 MEMBER CORRADINI: It's a different
11 system, as I understand it.

12 VICE CHAIRMAN ARMIJO: Yes, a different
13 system. But is it the same gas turbine design, same
14 size, same --

15 MR. KAWANAGO: No. No.

16 VICE CHAIRMAN ARMIJO: Very different.

17 MR. KAWANAGO: No. It's -- we committed
18 to that in our -- we used a different design and a
19 different manufacturer from an emergency power supply
20 system, gas turbine engine.

21 MEMBER SIEBER: Right.

22 VICE CHAIRMAN ARMIJO: Okay. But the
23 outputs are the same and --

24 MR. KAWANAGO: No, no, no.

25 VICE CHAIRMAN ARMIJO: They are very

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1 different.

2 MR. KAWANAGO: It's -- output is -- it's
3 a different, it's a slightly -- the emergency power
4 supply.

5 MEMBER-AT-LARGE STETKAR: And if I recall,
6 there are two alternate AC GT -- AAC GTGs.

7 (Laughter.)

8 You can probably say it easier than I can.

9 MEMBER SKILLMAN: May I please ask, what
10 was the equipment that was included in the
11 qualification test, please?

12 MR. KAWANAGO: Qualification test, it's --
13 I think it's -- we can show you the picture of the --
14 our technical effort is slightly -- however --

15 MEMBER CORRADINI: What was the type of
16 equipment tested, I think is what --

17 MEMBER SKILLMAN: I'm asking whether or
18 not it was the gas turbine, the speed reducer, plus
19 the alternator, as a combined package.

20 MR. KAWANAGO: It's a generator and the
21 gas turbine generator and the starting system and the
22 cooling system. But this is actually the -- an air
23 cooling, and also the -- and a combustion air system
24 and the fuel oil system and the governor and its
25 exhaust gas control system. It's the inside of the

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1 gas turbine generator that -- it started inside.

2 MEMBER SKILLMAN: In the alternator?

3 MR. KAWANAGO: It's -- alternator is --
4 is that --

5 MEMBER SIEBER: It's all on the same --

6 MR. KAWANAGO: Yes, yes, that's right.

7 MEMBER SKILLMAN: Thank you.

8 MEMBER-AT-LARGE STETKAR: The interesting
9 thing on this one, Rich, is they talk about it. If
10 you go back to the photographs that you have, these --
11 you'll notice two combustion chambers there. These
12 are actually two small tandem gas turbine generators,
13 one through -- essentially a gear box through a single
14 electrical generator.

15 So it's a little more complex than just a
16 single in-line gas turbine running a generator. And
17 I believe essentially what you see in that photograph
18 with the generator hung on it was put on the shape
19 test, the shape gauge.

20 MEMBER SKILLMAN: I was wondering if we go
21 from air and fuel to megawatts --

22 MEMBER-AT-LARGE STETKAR: Yes, I --

23 MEMBER SKILLMAN: That's my -- that's the
24 real question.

25 MEMBER-AT-LARGE STETKAR: I believe that

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1 was the case, and I that's -- we asked them about
2 that.

3 MEMBER SKILLMAN: Is the answer yes to
4 that question? The entire -- the package that you
5 have tested is actually from combustion air and fuel
6 to power output? Like if power --

7 MR. KAWANAGO: That's right. That's
8 right.

9 MEMBER SKILLMAN: Thank you.

10 VICE CHAIRMAN ARMIJO: I think there was
11 a video showing --

12 MEMBER-AT-LARGE STETKAR: There is a
13 video. I have a video that actually shows the shape
14 test.

15 VICE CHAIRMAN ARMIJO: And the big box
16 with all sorts of stuff in it.

17 MEMBER-AT-LARGE STETKAR: Yes.

18 VICE CHAIRMAN ARMIJO: Okay.

19 MEMBER BROWN: Another one if I can?
20 Since they are separated by divisions, which is
21 obviously what we would like to see, since there is
22 only three starts on any air receiver, and in the
23 unlikely event that you have an unusual circumstance
24 where you really are unable to recharge, is there an
25 interlocked -- I'll call it that -- capability to

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1 cross-connect an air receiver from one division to
2 another, if you needed to --

3 MR. KAWANAGO: No, no.

4 MEMBER BROWN: -- in the overall --

5 MR. KAWANAGO: No.

6 MEMBER BROWN: So they are literally
7 separated.

8 MR. KAWANAGO: Separated, completely
9 separated.

10 MEMBER BROWN: And there is no ability to
11 connect them if you had to.

12 MR. KAWANAGO: Completely separated.

13 MEMBER BROWN: The next question was, the
14 only gas turbines -- I'm not a gas turbine guy, but
15 the Navy uses them, and they periodically have to pull
16 them out, refurbish them, and put them back in. Is
17 there -- what's the maintenance cycle for --

18 MEMBER SIEBER: Yes, there is.

19 MEMBER BROWN: Is it a five-year cycle, a
20 10-year cycle? Is it based on number of hours?

21 MEMBER SIEBER: Hours.

22 MEMBER BROWN: Have you got some feel for
23 that?

24 MR. KAWANAGO: Hold on.

25 (Pause.)

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1 It's basically when we have -- it's a
2 maintenance outage in, of course, a plant, okay? And
3 it's one and a half years or one year or two years.
4 And basically we don't -- and we just have the
5 maintenance to have the fiber scope and checking
6 inside.

7 MEMBER BROWN: So you are to do an
8 interior inspection each maintenance outage, every two
9 years roughly?

10 MR. KAWANAGO: Yes. But only by using a
11 fiber scope and checking inside. But over the -- and
12 when we have a long time over the -- and 3,000 hours
13 or 2,000 hours, and we need to have --

14 MEMBER BROWN: That's an endurance run
15 time, where you can continue --

16 MR. KAWANAGO: Continue it.

17 MEMBER BROWN: Okay.

18 MR. KAWANAGO: Continue it. It's
19 accumulate -- accumulate --

20 MEMBER BROWN: Cumulative.

21 MR. KAWANAGO: -- accumulate. And we need
22 to have the -- overhaul on the maintenance, and that
23 is -- and checking inside everything, but --

24 MEMBER BROWN: That's based on hours.

25 MR. KAWANAGO: Yes, hours.

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1 MEMBER BROWN: Hours of operation.

2 MR. KAWANAGO: But basically, it's a
3 periodic test, and monthly test is just two hours or
4 something like that. So that when you divide it it's
5 2,000 hours and -- by two and it takes -- and it's --

6 MEMBER BROWN: It takes a few years.

7 MEMBER-AT-LARGE STETKAR: Well, I mean,
8 every outage you typically have to run them for 24
9 hours I think and things like that, but it's a few
10 years between major overhauls.

11 MR. KAWANAGO: So our maintenance in a
12 plant is basically that when we have the 15 years and
13 after that, and we have the overhaul maintenance. But
14 -- and meanwhile, it's one year, two years, two three
15 years, or four years, just having an inspection,
16 checking the inside by using a fiber scope.

17 CHAIRMAN ABDEL-KHALIK: How much fill do
18 you have onsite, and how is it stored?

19 MR. KAWANAGO: It's gas turbine generator?

20 CHAIRMAN ABDEL-KHALIK: Yes.

21 MR. KAWANAGO: It's basically the -- on a
22 concrete shelf is one ton for the one on a gas turbine
23 generator, and the capacity is seven days.

24 CHAIRMAN ABDEL-KHALIK: Seven days.

25 MR. KAWANAGO: Yes.

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1 CHAIRMAN ABDEL-KHALIK: And what is the
2 pressure of the gas in the tank?

3 MR. KAWANAGO: Pressure?

4 CHAIRMAN ABDEL-KHALIK: What is the gas
5 pressure?

6 MR. KAWANAGO: Gas pressure?

7 CHAIRMAN ABDEL-KHALIK: Gas turbine burn
8 anything?

9 MR. KAWANAGO: Sorry, sometimes we have --
10 you have confusion, because we use --

11 CHAIRMAN ABDEL-KHALIK: No problem.

12 MR. KAWANAGO: Sorry.

13 CHAIRMAN ABDEL-KHALIK: No problem.

14 MR. KUMAKI: Shall I move on? Next?

15 MEMBER-AT-LARGE STETKAR: Yes, please.

16 MR. KUMAKI: Our next chapter is 10, Steam
17 and Power Conversion System. This chapter includes
18 turbine generator and the steam and power conversion
19 system, such as condenser or feedwater system, and so
20 on. And also, this chapter has no issues to be
21 discussed.

22 MEMBER-AT-LARGE STETKAR: And interesting,
23 for the benefit of the other Committee members,
24 although this chapter is called Steam and Power
25 Conversion System. The scope of this chapter also

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1 includes the emergency feedback system.

2 And we had some discussion at the
3 Subcommittee meeting regarding the emergency feedwater
4 system. You have two motor-driven emergency feedwater
5 pumps and two turbine-driven emergency feedwater
6 pumps.

7 There has been an issue raised -- and we
8 had some discussion in the Subcommittee meeting about
9 it -- the -- this is related between Chapter 10 and
10 Chapter 8. One of the things that we try to do in our
11 Subcommittee meetings is to connect the dots among the
12 different chapters that we review individually.

13 The rated life of the station batteries is
14 two hours -- the emergency DC batteries on this plant.
15 The turbine-driven emergency feedwater pump requires
16 DC for operation. However, MHI has identified an
17 issue that the turbine-driven emergency feedwater pump
18 also requires room cooling. That's correct?

19 MR. KAWANAGO: Yes.

20 MEMBER-AT-LARGE STETKAR: The room cooling
21 is AC powered. So the turbine-driven emergency
22 feedwater pump effectively requires AC power to
23 support its operation. They have done analyses, and
24 we have asked for the analyses to show that the
25 turbine-driven emergency feedwater pump indeed can

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1 remain operating for at least one hour, because that's
2 the nominal time that they include credit for
3 connecting those alternate AC gas turbine generators,
4 if the members can follow the convoluted logic here.

5 Essentially, during a loss of all AC
6 power, they -- because of the design and manual
7 requirements for the alternate AC gas turbine
8 generators, say they need -- they are essentially
9 saying they need one hour.

10 MEMBER CORRADINI: They may not, but
11 that's what they are --

12 MEMBER-AT-LARGE STETKAR: They may not,
13 but the analyses -- the station blackout coping
14 analyses say one hour.

15 MEMBER CORRADINI: And so the emergency
16 aux feedwater pump room would -- or turbine room would
17 heat up to a point that it would not --

18 MEMBER-AT-LARGE STETKAR: They say it will
19 be okay for an hour. We don't know how long --

20 MEMBER CORRADINI: Okay.

21 MEMBER-AT-LARGE STETKAR: -- past an hour
22 it may fail, nor have we seen any of the analyses that
23 indeed confirm that the -- you know, the temperatures
24 will remain less than the qualifications or rated
25 operating temperatures of all of the equipment in that

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1 room for an hour.

2 MEMBER CORRADINI: The critical components
3 are seals for the turbine, something --

4 MEMBER-AT-LARGE STETKAR: No, it's
5 probably electronics for the turbine speed control.

6 MEMBER CORRADINI: Okay.

7 CHAIRMAN ABDEL-KHALIK: Is the heatup of
8 the aux feedwater pump room during an event of this
9 type something that would need to be revisited during
10 COLAs?

11 MR. KUMAKI: That means operate -- go to
12 that room?

13 CHAIRMAN ABDEL-KHALIK: The heatup of the
14 aux feedwater.

15 MR. KUMAKI: No, we don't.

16 CHAIRMAN ABDEL-KHALIK: So you think that
17 the response of the aux feedwater pump room during
18 this total loss of AC is something that will be
19 specified in the DCD and won't have to be revisited
20 during COLA applications?

21 MR. KUMAKI: What is --

22 MR. SAMAMOTO: This is Uchida Samamoto,
23 MNES. We discussed this in the Subcommittee. That is
24 why we only use the one hour is because we can't use
25 AAC power after one hour. So we --

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1 (Microphone feedback.)

2 -- emergency feedwater pump can't use
3 after one hour for that --

4 (Microphone feedback.)

5 -- assumption for the --

6 MEMBER-AT-LARGE STETKAR: Stand back a
7 little bit, and somebody -- Theron, can you turn down
8 the gain a little bit? Because we're getting a little
9 feedback, even on the table here.

10 MR. SAMAMOTO: We explained the basis with
11 HVAC. We already calculated that in Chapter 19.

12 MEMBER-AT-LARGE STETKAR: Okay.

13 MR. SAMAMOTO: Chapter 19 is calculated
14 without HVAC system in emergency power --

15 MR. KAWANAGO: Our answer is -- sorry --
16 in Chapter 19. In a DCD scope in Chapter 19, we
17 calculate, and, actually, the temperature of the room
18 of the emergency feedwater pump within one hour.
19 Within one hour. So that means that is a DCD scope,
20 not the COLA scope.

21 MEMBER-AT-LARGE STETKAR: Okay. I think
22 what -- is there any requirement for the COL applicant
23 to confirm that heatup by actually running a test and
24 measuring the temperature in the room? I know you do
25 a calculation, but the calculation is the basis for

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1 justifying the design. Is there any requirement that
2 the COL applicant actually run a test and verify that
3 the temperature remains below the calculated limit?

4 MR. KAWANAGO: I think there are two
5 elements. One is, first, at least a COL applicant
6 needs to check whether the condition of the
7 calculation is bounding by the DCD or not. That is
8 Chapter 2 basis, and it's what is environmental -- the
9 condition, and we need to check. Okay? That is a COL
10 applicant, and it's an important element.

11 And also, and in ITAAC -- in ITAAC, in the
12 stage, and COL applicant needed to check. And
13 whether, actually, there is a design condition and
14 it's actually the -- it's the same. We think that is
15 the --

16 CHAIRMAN ABDEL-KHALIK: But this is just
17 comparing the site conditions and making sure that
18 they are within the --

19 MR. KAWANAGO: Sure.

20 CHAIRMAN ABDEL-KHALIK: -- envelope.

21 MR. KAWANAGO: Yes, sure.

22 CHAIRMAN ABDEL-KHALIK: But no requirement
23 for an actual test to confirm the validity of the
24 calculation. Is there?

25 MR. SAMAMOTO: This is Uchida Samamoto

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1 again. We don't request COL applicants to perform
2 such a test, you know, request of --

3 MR. KAWANAGO: This is because we clearly
4 explained to you, and basically that calculation basis
5 we only use the design parameter of the pumps and also
6 the -- and equipment, okay? So that means -- and
7 when, actually, we go to the manufacturing stage, in
8 the manufacturing stage or procurement stage, each
9 pump, not including a diesel emergency -- an emergency
10 -- feedwater pumps or every safety-related component
11 will be tested -- will be tested in the manufacturer.
12 Okay? So need to check whether that pump can meet the
13 design requirement or not.

14 If the manufacturer shows our -- we can
15 show that equipment meet to the design criteria, that
16 is actually the meet to the -- meet to the condition
17 of the calculation of Chapter 19.

18 VICE CHAIRMAN ARMIJO: So you will test
19 higher temperature, qualify for the higher
20 temperature. But I think the question was --

21 MR. KAWANAGO: But the --

22 VICE CHAIRMAN ARMIJO: -- are you
23 verifying?

24 MR. KAWANAGO: -- design basis.

25 VICE CHAIRMAN ARMIJO: I thought the

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1 question was: how do you verify that the temperature
2 will be what you expect it to be in the room?

3 MR. KAWANAGO: Actually, by using a test.
4 The answer is no.

5 MEMBER-AT-LARGE STETKAR: Okay. We will
6 -- I think that's something we can follow up with the
7 staff, because that's typically something that the
8 staff may ask to be included.

9 MR. PAULSON: Well, you're looking at --
10 or what you're asking is a starting point, is --

11 MEMBER-AT-LARGE STETKAR: An in situ test.

12 MR. PAULSON: Right.

13 MEMBER-AT-LARGE STETKAR: He starts the
14 turbine, runs it, and --

15 MR. PAULSON: Based on what the
16 temperature is meant to be in that room, and look at
17 the heatup based on the performance of equipment, and
18 see where it ends up in an hour. And is it under the
19 temperature --

20 MEMBER-AT-LARGE STETKAR: Given actual
21 room conditions with the actual installation
22 properties of the room --

23 MR. PAULSON: I think we understand the
24 question. We'll --

25 MR. KAWANAGO: We understand.

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1 MR. PAULSON: We'll respond.

2 CHAIRMAN ABDEL-KHALIK: What is the
3 temperature limit?

4 MR. SAMAMOTO: I can answer. Basically,
5 Chapter 9 is -- calculation is over eight hours.

6 CHAIRMAN ABDEL-KHALIK: It can't be eight
7 hours.

8 VICE CHAIRMAN ARMIJO: One hour.

9 CHAIRMAN ABDEL-KHALIK: What is the
10 temperature limit? What is the limit at which --

11 MR. KAWANAGO: I think it's -- we will
12 answer later. It's okay?

13 MR. SAMAMOTO: But my understanding is
14 basically instrument temperature is limiting to --

15 MR. KAWANAGO: Numbers.

16 MEMBER-AT-LARGE STETKAR: What he's asking
17 for, basically -- whatever the limiting equipment,
18 it's probably the electronics and the turbine control
19 system, what are the -- you know, what's the design
20 qualification temperature for those electronics? I
21 could speculate, but it's better for you if --

22 MR. KAWANAGO: I'm sorry. We checked --
23 50 degrees Celsius. That is design limiting.

24 MEMBER-AT-LARGE STETKAR: Okay.

25 MR. PAULSON: What, it's 122 degrees

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1 Fahrenheit?

2 MEMBER-AT-LARGE STETKAR: That's pretty
3 standard for most electronics. I wanted to make sure
4 there wasn't anything else that was a surprise. But
5 that's also a fairly modest temperature if you have a
6 well-insulated concrete room with some steam lines
7 going into it, so -- especially if it's a relatively
8 small room.

9 MR. KUMAKI: So move on?

10 MEMBER-AT-LARGE STETKAR:

11 Any other questions about emergency
12 feedwater?

13 CHAIRMAN ABDEL-KHALIK: Let me just follow
14 up on this calculation of the maximum room temperature
15 over a one-hour period where the HVAC system is not
16 operational, presumably.

17 I assume that you rely on heat transfer
18 through the walls of the room. What if you assume
19 totally adiabatic conditions, how long does it take to
20 reach that 122 degree F or 50 degrees C, without heat
21 transfer across the walls of the room?

22 MR. KUMAKI: I understand.

23 MEMBER-AT-LARGE STETKAR: In fairness to
24 MHI, we haven't seen Chapter 19 or those calculations
25 yet. So we're treading a little bit beyond -- it's

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1 fair to ask the questions, but they may not have the
2 appropriate people here.

3 CHAIRMAN ABDEL-KHALIK: Well, this is a
4 very important piece of equipment.

5 MEMBER-AT-LARGE STETKAR: Yes.

6 MR. SHIKAKA: Yes. This is Ato Shikaka.
7 We haven't done the calculation for that. When we
8 submitted the response, the calculation results in
9 Chapter 19 RAI response, has been submitted I think
10 this May or June timeframe. I think it is in review
11 right now.

12 CHAIRMAN ABDEL-KHALIK: But the first
13 statement you made, that you have not done the
14 adiabatic --

15 MR. SHIKAKA: Correct.

16 CHAIRMAN ABDEL-KHALIK: -- calculations.

17 MR. SHIKAKA: Right.

18 CHAIRMAN ABDEL-KHALIK: Okay.

19 MEMBER-AT-LARGE STETKAR: This is a bit of
20 a problem we get into. It's efficient for us to
21 review chapters on a chapter-by-chapter basis, but, as
22 you see, there are some issues that sort of bridge
23 among several chapters.

24 What we're discussing now is kind of a
25 Chapter 8, Chapter 10, Chapter 19, and perhaps Chapter

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1 9 that covers ventilation systems issue, which is one
2 of the functions that we perform. But at times the
3 timing of our review doesn't necessarily coincide with
4 the functional requirements for some of the systems.

5 So this is an issue, by the way, that we
6 are tracking from the Subcommittee meetings, the
7 justification for the room heatup analyses and not
8 only the survivability for an hour but what -- how
9 long could the turbine survive, actually, without AC
10 cooling? Which is a different issue in terms of long-
11 term operation under no AC power conditions.

12 MR. KUMAKI: So I should move on?

13 CHAIRMAN ABDEL-KHALIK: How about manual
14 control of the turbine-driven aux feedwater pumps?
15 Can the operator manually control the pumps?

16 MR. KUMAKI: We don't need manual control.

17 VICE CHAIRMAN ARMIJO: That wasn't the
18 question.

19 (Laughter.)

20 MR. KUMAKI: The question was, can --

21 VICE CHAIRMAN ARMIJO: Is it possible?

22 MR. SAMAMOTO: We would like to confront
23 -- you mean the manual is manual startup?

24 MR. KUMAKI: I think it's --

25 MR. SAMAMOTO: A few lines by manual, it's

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1 possible. But basically, we can't start up from that
2 main control room manual switch, but we can use open
3 -- startup by manual.

4 MR. SPRENGEL: This is Ryan Sprengel. On
5 those, I think they're asking -- correct me if I'm
6 wrong -- if you can manually control the speed.

7 CHAIRMAN ABDEL-KHALIK: The startup and
8 speed.

9 MEMBER-AT-LARGE STETKAR: I tend to call
10 it mechanical rather than manual, because it avoids
11 the notion of pushing buttons. This is someone
12 locally in the room operating the steam admission
13 valve to control the turbine.

14 MEMBER SIEBER: Yes. What kind of
15 governor does it have? Is it water? Usually there's
16 not --

17 MR. KAWANAGO: This is steam driven.

18 MEMBER-AT-LARGE STETKAR: Just speak up in
19 the mic. We need to have you on the record here.

20 MR. KAWANAGO: What we answered to you is
21 that in the main control room there is a manual
22 switch, and operator can start manually. And also,
23 when they go to the -- it's -- on a local site, and
24 operator can work it in manually, and it can start in
25 a turbine-driven --

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1 MEMBER-AT-LARGE STETKAR: There's no
2 electrical signal that will override it.

3 MR. KAWANAGO: No, no. No. We don't need
4 to do half the DC power. We don't need to do half the
5 DC power. If the operator goes through the --

6 CHAIRMAN ABDEL-KHALIK: Local control.

7 MR. KAWANAGO: Yes.

8 CHAIRMAN ABDEL-KHALIK: Thank you.

9 MR. KUMAKI: Next chapter, Chapter 11,
10 Radioactive Waste Management. This chapter includes
11 the kind of waste management systems for liquid,
12 gaseous, and solid. I think this is -- there is no
13 issue for the -- to be discussed.

14 And next, Chapter 12, Radiation
15 Protection. This chapter includes the discussion
16 about the radiation sources, radiation protection
17 design features, and the dose assessment. And also,
18 we exchange many other errors. And right now we have
19 no issues to be discussed.

20 Chapter 13 is Conduct of Operations. This
21 chapter includes information relating to the
22 preparation in the plant for US-APWR plant design,
23 construction, and operation. And those are -- this
24 chapter includes kind of security issues.

25 Also, we exchanged many other errors with

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1 the NRC, and there are some open items. But right now
2 we closed all open items. There is no issues to be
3 discussed.

4 This is the last chapter of this today,
5 Chapter 16, Technical Specifications. Basically, US-
6 APWR technical specification is the same, almost same
7 as the standard technical specification as addressed
8 in NUREG-1431 for the Westinghouse plant. This
9 chapter includes safety limits, limiting safety system
10 setting, limiting condition for operation,
11 surveillance requirements, design features, and
12 administrative controls. And also, this chapter has
13 no issues to be discussed.

14 MEMBER-AT-LARGE STETKAR: Chapter 16, for
15 the design certification you have, as you mentioned,
16 only the standard technical specifications. Is that
17 correct?

18 MR. KUMAKI: Most of it.

19 MEMBER-AT-LARGE STETKAR: Most.

20 MR. KUMAKI: Yes.

21 MEMBER-AT-LARGE STETKAR: The reason I ask
22 the question is I believe that, in particular, the
23 reference combined license applicant, Comanche Peak,
24 has indicated that they intend to risk-inform the
25 technical specifications. That's -- but from the

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1 purpose of the design certification, there is no risk
2 information in the technical specifications, is that
3 correct?

4 MR. KUMAKI: Yes, correct.

5 MEMBER-AT-LARGE STETKAR: Okay. Thank
6 you. That's also a difference when we come to the COL
7 review for this particular design center, the
8 reference COL plant anyway. Comanche Peak has
9 indicated that they are interested or intending to
10 submit risk-informed technical specifications, and
11 that also is the only design center that has indicated
12 that so far. So that's a different issue that we will
13 have to address as a committee when we review the COL
14 application for Chapter 16.

15 MR. KUMAKI: So this is the end of my
16 presentation of today. I thank you very much for your
17 attention.

18 MEMBER-AT-LARGE STETKAR: Do members have
19 any other questions or comments on any of these
20 chapters?

21 MEMBER SKILLMAN: I do. I would like to
22 explore a little bit what is really open on the
23 advanced accumulator in the absence of low head safety
24 injection pumps. Your comment, Kumaki-san, is that
25 this is part of future discussion. And I am curious

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1 what the features of that future discussion will be,
2 please.

3 MR. KUMAKI: So our advanced accumulator
4 has a flow damper. That flow damper can change the
5 flow rate from large flow to small flow, so we -- our
6 advanced accumulator injection flow has two flows. So
7 we tried to explain about -- for those features or
8 systems or our assumption, and also we exchanged many
9 RAIs with NRC, especially NRC requested us to
10 calculate using a CFD calculation. So we will explain
11 for those kind of things in future.

12 MEMBER-AT-LARGE STETKAR: That's covered,
13 Dick, under Chapter 6 of the safety evaluation report,
14 which is somewhere out in the schedule.

15 MEMBER SKILLMAN: Thank you.

16 MEMBER-AT-LARGE STETKAR: They have a
17 separate technical report that they submitted. We
18 have had -- I don't recall right now whether it was a
19 full committee or subcommittee briefing on the design
20 of the accumulator. I think it was -- was it full
21 committee, Dennis?

22 MEMBER BLEY: It was back when Otto was
23 still here.

24 MEMBER-AT-LARGE STETKAR: Yes. So a
25 couple of years ago. There have been extensive -- and

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1 we are going to discuss that, I'm sure, in a lot of
2 detail under Chapter 6 when it comes before us.

3 MR. SPRENGEL: Let me be clear -- this is
4 Ryan Sprengel -- we do have an accumulator topical
5 report. So you --

6 MEMBER-AT-LARGE STETKAR: It is topical.

7 MR. SPRENGEL: And you have a CFD
8 technical report supporting that.

9 MEMBER-AT-LARGE STETKAR: So there will --

10 MR. SPRENGEL: I'm sorry. I didn't recall
11 whether it was technical or topical. I get them --

12 MEMBER-AT-LARGE STETKAR: Thank you.

13 MR. SPRENGEL: -- mixed up in my thoughts.

14 MEMBER-AT-LARGE STETKAR: Thanks, Ryan.

15 MEMBER BROWN: My memory is we did not --
16 we didn't go through a whole lot of detail.

17 MEMBER-AT-LARGE STETKAR: They will be
18 addressed in detail during Chapter 6, and probably
19 Chapter 15 also, neither of which is on our short-term
20 horizon yet.

21 By the way, if you're having discussions,
22 we need to have them on the record. So just be
23 careful.

24 Any other questions, comments, for MHI?

25 (No response.)

1 Thank you very much. I appreciate the way
2 you organized the discussion. I think you highlighted
3 the points that we wanted to highlight, and I
4 appreciate your responsiveness to our questions. So
5 thank you.

6 And with that, we will ask the staff to
7 come up.

8 (Pause.)

9 Jeff, are you ready?

10 MR. CIOCCO: Okay. Good morning. My name
11 is Jeff Ciocco. I am the lead project manager for the
12 US-APWR design certification for the NRC. I have been
13 the lead project manager on this I think since dating
14 back to about 2006. So we will go through today kind
15 of an overview.

16 First, I will cover where we are as far as
17 the licensing overview for the entire project, a quick
18 summary of the safety evaluation reports, and then
19 what we consider one of our technical challenges, as
20 we talked about, our gas turbine generator, a unique
21 design feature.

22 A lot of information on this page. This
23 is our chronology of this design certification. We
24 started a pre-application activity, holding a series
25 of about eight public meetings beginning back in July

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1 of 2006. On New Year's Eve of 2007, Mitsubishi
2 tendered its US-APWR design certification.

3 In between the pre-application and the
4 submittal of the application, we also received 13
5 topical reports, some of which you heard about today,
6 the advanced accumulator. So those topical reports
7 are also -- staff is preparing safety evaluation
8 reports. We received topical reports in the areas of
9 the fuel design, of the advanced accumulator, of the
10 digital I&C accident analysis, non-LOCA, large break
11 LOCA, small break LOCA, as well as human factors
12 engineering.

13 Two of the topical reports we have
14 completed SERs. One has been through the ACRS, and
15 that is our defense-in-depth D3. We did about a
16 three-month acceptance review of the application, and
17 we docketed the application the end of February of
18 2008.

19 At that time, we established an overall
20 schedule for the design certification review. And
21 then, in August of 2008, we had our first revision of
22 our design control document, our first revision of
23 three. We're on Rev 3. And this revision came in
24 because of engineering changes. The initial
25 application came in.

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1 There was a design plan to complete
2 certain areas of the application, such as the piping
3 systems components, digital I&C, which weren't fully
4 completed when the application was tendered. But
5 there was a plan to get it, as well as the sump
6 design.

7 So Revision 1 came in in October 2008
8 because of engineering changes, as well as some RAI
9 responses. Mitsubishi will update the application.
10 And with that design control document, I must add that
11 there was about 150 technical reports referenced in
12 that design control document, as well as the 13
13 topical reports.

14 And there was a period of time, as John
15 Stetkar mentioned, between February 2008 through about
16 May of 2009, Mitsubishi and the NRC staff conducted
17 informational briefings to the ACNW -- or, I'm sorry,
18 ACRS Subcommittee back into the --

19 MEMBER-AT-LARGE STETKAR: They still
20 existed, I think, at that time.

21 MR. CIOCCO: Yes, I know. I'm looking at
22 Dr. Ryan. But we have been to the ACRS Subcommittee
23 probably at least 13 times, and we did informational
24 briefings. We introduced the US-APWR design. We
25 talked about the advanced accumulator, all of our fuel

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1 design topical reports, digital I&C, human factors
2 engineering, which I think we also supported the trip
3 to the human factors simulator up in MEPE in
4 Pittsburgh back then.

5 We talked about the LOCA topical reports,
6 as well as our gas turbine generator. I think there
7 has been two or three informational briefings. And we
8 are also conducting -- MHI is going to present an
9 informational briefing on the long-term cooling on the
10 GSI-191 on this November 30th to the ACRS
11 Subcommittee.

12 So moving along, in June of 2009, the
13 Phase 1 review was completed. That is the initial
14 review where we issue RAIs, and we complete a very
15 preliminary safety evaluation report with all of the
16 open items. And then, in October 2009, Revision 2 of
17 the design control document came in.

18 At that time, there is now the RCOLA for
19 Comanche Peak Units 3 and 4, there were some changes
20 in supplier information as well as the engineering
21 progress, and RAI responses were incorporated into
22 that Revision 2.

23 And then, encompassing the period of May
24 of last year through August this year, up to the
25 present, we completed our Phase 2 review of these

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1 eight chapters that we're talking about today. And we
2 presented all of those eight chapters to the ACRS
3 Subcommittee.

4 And then, finally, the end of March this
5 year, the current revision is Revision 3 -- was
6 submitted to the NRC. It's on the docket. A lot of
7 changes in this revision. There are engineering
8 changes along the way due to RAI responses. There was
9 an ITAAC improvement effort. There were some
10 engineering simplified layout drawings, conceptual
11 design information, etcetera, that came in with our
12 Revision 3 of the DCD. And that's currently what the
13 staff is working on.

14 And a lot of the SERs that were submitted
15 that we are talking about today were actually written
16 back on Revision 2. So as we progress through
17 Phases 4, 5, and 6, they will be updated to the most
18 current revision of the DCD.

19 Next is our review schedule. As you can
20 see, we operate under a six-phase licensing review
21 process followed by rulemaking at the very end.
22 Phase 1 was completed back in 2009. Phase 2 is where
23 the really heavy lifting goes. Most of our licensing
24 review, the manhours are put into Phase 2. We don't
25 move -- we don't complete a Phase 2 review until we

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1 are pretty sure that we have resolution on the open
2 items and a good path forward, which is, as this
3 schedule says, January 2012.

4 I will say that this schedule is currently
5 under evaluation. We have some additional scope and
6 some particularly challenging areas, as in the seismic
7 and structural analysis in Chapter 3, 3.7, 3.8. So
8 this schedule is under evaluation for possible
9 schedule extension, to incorporate the additional
10 scope.

11 And then, Phase 3 -- and we do go -- and
12 Phase 3 as a chapter is completed and delivered to the
13 ACRS. We then schedule our briefing, so there are a
14 lot of things done in parallel. In Phase 4, we will
15 complete the SER with no open items, come back in
16 Phase 5, address the open items with the Committee,
17 and any questions they have, and then we'll issue the
18 FSER followed by the rulemaking.

19 I have one slide to cover all of our
20 chapters that we have. To date, we have completed
21 Chapters 2, 5, 8, 10, 11, 12, and 13, as we heard from
22 MHI, and Chapter 16, our tech specs. They have been
23 issued to MHI. They have been made publicly
24 available, and they have been presented to the ACRS
25 Subcommittee.

1 We have issued many, many RAI questions,
2 in the thousands. We are on about 4,800 questions in
3 total, which have resulted in a number of open items,
4 which we have presented to the ACRS Subcommittee as
5 well.

6 There are no significant technical issues
7 for any of these chapters, and that's not to say that
8 there aren't challenges. We believe that we are on a
9 good path to resolution for the open items that we
10 have identified in these chapters, or we certainly
11 wouldn't be moving out of Phase 2.

12 There are unique design features, a lot of
13 them you are going to hear the next time we come to
14 the full Committee -- Chapter 4 in the fuel design;
15 Chapter 6, we heard the advanced accumulator, the
16 digital I&C, the entire accident analysis; and the PRA
17 in Chapter 19. So we have a lot to do yet, a lot of
18 work going on, but no significant technical issues in
19 these first eight chapters that we have.

20 CHAIRMAN ABDEL-KHALIK: Would you care to
21 comment about the question that was raised to the
22 applicant regarding the adequacy of this one hour
23 calculation for the temperature in the aux feedwater
24 room?

25 MR. CIOCCO: I don't have --

1 CHAIRMAN ABDEL-KHALIK: Whether that needs
2 to be verified by an actual test?

3 MR. CIOCCO: Let me see if we have any
4 technical staff who wants to address the question.

5 MR. STUBBS: Good morning. My name is
6 Angelo Stubbs. I'm the reviewer of the emergency
7 feedwater system. And as far as verification by a
8 test of the room temperature -- and this will be part
9 of the station blackout coping -- in certain
10 situations you have -- under station blackout
11 equipment can -- that can be impacted by the
12 environment, maybe by minimum temperature, control
13 room --

14 CHAIRMAN ABDEL-KHALIK: We're talking
15 about this specific case.

16 MR. STUBBS: For this specific case, if we
17 see the evaluation, the analysis, and there is -- and
18 they have conservatively done the analysis, I do not
19 believe that we need to have it validated.

20 And I also don't think it's as simple as
21 saying -- it's that simple to actually do, because we
22 would still probably have to extrapolate your results
23 to find out whether you meet the condition, because
24 you -- to do this you would have to look at the
25 assumptions made in terms of initial conditions, heat

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1 loads, the temperature surrounding rooms, and a lot of
2 other things that you may not be able to duplicate
3 exactly.

4 Unless they are taking a lot of credit for
5 transfer of heat from one area to another area,
6 through rooms, the heat capacity of the materials in
7 the room, I don't think you would need to do that. I
8 think just simply looking at an evaluation, looking at
9 the heat load, and looking at the --

10 CHAIRMAN ABDEL-KHALIK: You are telling me
11 you don't need a test, because the calculation is too
12 complicated?

13 MR. STUBBS: No. I'm not saying that
14 it's --

15 CHAIRMAN ABDEL-KHALIK: Is that what
16 you're saying?

17 MR. STUBBS: No. I'm not saying you don't
18 need to test it because the calculations are too
19 complicated. I'm saying when you -- if you do a test
20 and you get results, you probably will not test -- the
21 test that is identical to what the calculation
22 assumed, and you will have to adjust your results to
23 find that out.

24 You could do a test and come in below, but
25 because you are not in the condition that you would be

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1 in when the station blackout occurs, that will not
2 necessarily mean that the station blackout will add --
3 that at the most limiting condition before the station
4 blackout occurs will give you that same result.

5 CHAIRMAN ABDEL-KHALIK: Presumably, the
6 calculation was done at the most limiting condition to
7 show that --

8 MR. STUBBS: Correct.

9 CHAIRMAN ABDEL-KHALIK: -- you know, that
10 you still have at least an hour.

11 MR. STUBBS: Right.

12 CHAIRMAN ABDEL-KHALIK: Couldn't you
13 define an experiment in which you can actually
14 duplicate the most limiting condition?

15 MEMBER SIEBER: You have to wait for a hot
16 day I guess.

17 MR. HAMZEHEE: Let me just ask a question.
18 Are you asking, is it required to do that test? Or
19 are you asking, is it a good thing to do?

20 CHAIRMAN ABDEL-KHALIK: Is it
21 contemplated? Is it a good thing to do? Is it
22 necessary to do?

23 MR. HAMZEHEE: And I think -- correct me
24 if I'm wrong -- I don't believe right now the staff
25 thinks that this is a necessary thing to do. But if

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1 there is a reason -- and maybe the evaluation or
2 analysis not sound -- then they may ask followup
3 questions, and then also ask for any necessary
4 testing. But at this time, I believe the staff did
5 not find it necessary to perform the test.

6 CHAIRMAN ABDEL-KHALIK: Because they found
7 the analysis to be conservative and adequate?

8 MR. STUBBS: No. I believe it's not
9 necessary to do the performance test, because -- like
10 when we do sub-compartment analysis, when we calculate
11 long-term -- things for everything, a test would
12 probably -- if we were to look at a test, it would be
13 to validate some type of assumptions that they used
14 that we're not completely sure are conservative, and
15 their results are impacted by something that is either
16 specific to how you actually do materials and design
17 and/or because we don't have confidence in their
18 evaluation.

19 MEMBER SIEBER: It would seem to me that
20 any test that you would conduct would require an
21 extrapolation to --

22 MR. STUBBS: Correct.

23 MEMBER SIEBER: -- to determine whether
24 you meet the minimum capabilities that are required?
25 Considering you really can't do a test at the right

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1 conditions.

2 MR. HAMZEHEE: That's correct.

3 CHAIRMAN ABDEL-KHALIK: Let me ask a
4 question, then, of either the staff or the applicant.
5 Let's say the turbine-driven aux feedwater pumps are
6 operating, and you have AC power. How hot does it get
7 in that room?

8 MEMBER SIEBER: You have AC power?

9 MR. STUBBS: We asked that question in an
10 RAI, and their response was that they do not -- they
11 stay below the 175 degree temperature F.

12 MR. HAMZEHEE: Are you talking about when
13 you lose HVAC or while the HVAC is working?

14 CHAIRMAN ABDEL-KHALIK: While the HVAC is
15 working. Everything is -- there is AC, you know, the
16 aux feedwater pumps are running during a transient,
17 and you still have AC. How hot does it get in that
18 room?

19 MR. HAMZEHEE: MHI, do you have any answer
20 for that? Maybe they should respond to this question.
21 Under normal conditions, your HVAC is working, your
22 turbine-driven pumps are running, what is the room
23 temperature? Hopefully, it is below 100 degrees, but
24 I don't know.

25 MR. SAMAMOTO: We cannot answer now. We

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1 need to confirm.

2 CHAIRMAN ABDEL-KHALIK: Okay. So the
3 followup question, then, you have a situation in which
4 the turbine-driven aux feedwater pumps are running.
5 You have AC power, and you reach that relatively high
6 temperature, which I suspect will be much higher than
7 122 degrees F, the 50 degrees C, that he is talking
8 about.

9 If that is the case, if you were to lose
10 AC at that point, would you still be able to restart
11 the pumps after an hour?

12 MR. STUBBS: I don't understand the
13 question that you're asking.

14 MR. HAMZEHEE: I think this is a different
15 situation. Your turbine-driven pump is running, your
16 HVAC is working. And then, as the temperature in the
17 room goes up, at some point you lose AC power. So now
18 he wants to know how fast the room is going to heat
19 up, because you are already at a high level and you
20 may reach that limiting condition very quickly.

21 CHAIRMAN ABDEL-KHALIK: You may not be
22 able to restart those pumps at all.

23 MR. STUBBS: I'm still not clear exactly
24 what you are talking about. If you have AC power
25 initially, and you also have the electric-driven motor

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1 -- motor-driven pumps, are you talking about you lose
2 the -- if you have AC power, you have the motor-driven
3 pumps. Are you talking about after the pumps restart?

4 MR. HAMZEHEE: I think let me clarify the
5 scenario. You have -- for some reason you are in an
6 accident condition, your turbine-driven pump starts,
7 and your HVAC room cooling is working. At some point
8 in time, you lose AC power. So your motor-driven
9 pumps are not going to work anymore. Now you have to
10 restart your turbine-driven pump.

11 I think he want to know, at that point,
12 since you are under different environmental condition,
13 how fast do you reach the temperature? Number one.
14 Number two, can you restart the turbine-driven pump?

15 CHAIRMAN ABDEL-KHALIK: Ever.

16 MR. HAMZEHEE: I think that's the
17 question. Am I right?

18 CHAIRMAN ABDEL-KHALIK: Yes.

19 MR. STUBBS: MHI will have to answer that
20 question.

21 MEMBER-AT-LARGE STETKAR: If you're
22 answering, you have to come up and state your name and
23 speak at the microphone.

24 MR. SEGALA: Yes. This is John Segala
25 from the staff. I'm the Chief of the Balance of Plant

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1 Branch. You know, the HVAC system or the coolers for
2 that room are designed for the accident heat load, so
3 that will be designed to maintain the temperature of
4 that compartment or that room. That is -- you know,
5 the people that would do that review, that would be
6 more of a Chapter 6 review, Chapter 9, Chapter 6.

7 But that would be, I assume, the initial
8 conditions for the analysis that was performed in the
9 scenario that they did the heatup calc for.

10 CHAIRMAN ABDEL-KHALIK: Well, that -- is
11 that the case?

12 MR. HAMZEHEE: Does MHI want to shed any
13 information on this?

14 MR. KAWANAGO: This is Shinji Kawanago
15 from MNES again. And the basis of the calculation of
16 the temperature is that it is -- there's minimum
17 temperature and maximum temperature for the
18 calculation. And the starting point of the increased
19 temperature, we use a maximum temperature.

20 And this is -- for example, the starting
21 out turbine driven, auxiliary feedwater pump, it's --
22 if there is AC power, in that case, ventilation system
23 is operating. So the -- and room temperature
24 controlled between the maximum -- minimum and the
25 maximum, okay?

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1 So if there is a failure in the
2 ventilation system because of the failure of the
3 emergency power supply system, and we calculate it
4 from the start, from the maximum temperature, and
5 within one hour, and that temperature were not beyond
6 the design temperature limitation, and if -- and URL,
7 I would like to correct my answer.

8 I answered to you that 50 degrees C is a
9 design limitation, but actually the -- it is my
10 misunderstanding. I am so sorry. It is conditions
11 80 degrees C. That is limiting condition. So then,
12 we calculate from the maximum normal temperature to
13 the design limit. And the reason is there is no
14 increase.

15 CHAIRMAN ABDEL-KHALIK: So the
16 50 degrees C is the normal temperature in the room
17 when the pumps are operating?

18 MR. KAWANAGO: It's --

19 CHAIRMAN ABDEL-KHALIK: With HVAC?

20 MR. KAWANAGO: Normal is -- maximum is 105
21 degrees and --

22 CHAIRMAN ABDEL-KHALIK: And the limiting
23 temperature is 180 degrees F, or 80 degrees C, you
24 said?

25 MEMBER BLEY: That's what he said.

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1 MR. KAWANAGO: 175 --

2 CHAIRMAN ABDEL-KHALIK: 175.

3 MR. KAWANAGO: -- degrees Fahrenheit.

4 CHAIRMAN ABDEL-KHALIK: Okay. So if for
5 some reason the operators need to start these pumps
6 manually during that time period, how would they get
7 there if the temperature is somewhere close to 175 F,
8 or try to control the pumps manually?

9 MR. KAWANAGO: Sorry, but I cannot
10 understand. What is the starting condition? Is it
11 station blackout and without AC power?

12 CHAIRMAN ABDEL-KHALIK: Right. And you
13 are -- during that heatup period, and for some reason
14 you need to control flow.

15 MR. HAMZEHEE: If you remember, maybe
16 that's why MHI -- correct me if I'm wrong -- did not
17 credit it manual initiation or control. Remember,
18 that's what they mentioned earlier in their
19 presentation.

20 Now, they said it's feasible, but they did
21 not take credit for it.

22 CHAIRMAN ABDEL-KHALIK: Okay. I think we
23 will have to revisit this when we talk later on. I
24 don't know where would be the appropriate chapter to
25 talk about this. John?

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1 MEMBER-AT-LARGE STETKAR: Yes. That's --
2 well, it -- we're tracking it. It's probably an issue
3 for Chapter 19, because that's eventually where
4 everything comes together. It might be Chapter 9,
5 which is ventilation systems designs. It might be
6 Chapter 6, as you mentioned. But my suspicion is
7 Chapter 19. It will --

8 MR. HAMZEHEE: And I think as a general
9 comment -- I hope it helps -- that as they do these
10 analyses, and once they define what the upper design
11 limit is, then by regulation they are required to
12 demonstrate, as part of the equipment qualification,
13 that all of these necessary components can function up
14 to that temperature. So --

15 CHAIRMAN ABDEL-KHALIK: Thank you.

16 MEMBER REMPE: Before we leave this, can
17 we repeat what the temperatures were? Because they
18 kept switching.

19 MEMBER-AT-LARGE STETKAR: What is -- for
20 MHI, just for the record, for clarity, which is the
21 design qualification temperature for the equipment in
22 the turbine-driven emergency feedwater pump room?

23 MR. KAWANAGO: We answered to you,
24 basically, the design limitation is 80 degrees.

25 MEMBER-AT-LARGE STETKAR: Eighty degrees

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1 C.

2 MR. KAWANAGO: So that is an equipment
3 requirement.

4 MEMBER-AT-LARGE STETKAR: Okay. Eighty
5 degrees C.

6 MR. HAMZEHEE: Close to 175 F?

7 MEMBER-AT-LARGE STETKAR: I just wanted to
8 make sure we had it, because there were a few
9 different numbers floating around, and now we have it
10 on the record.

11 MR. HAMZEHEE: And I think, John, as part
12 of your question last time, I believe MHI is going to
13 provide some heatup calculations, so that you can see
14 the design distribution.

15 MEMBER-AT-LARGE STETKAR: Essentially, in
16 the Subcommittee meeting we requested the actual room
17 heatup curves, not only to see what the calculations
18 showed, to confirm the survivability for the first
19 hour, but also past the first hour to see where -- if
20 you get to a steady-state temperature, what it is; if
21 you don't, when you reach, you know, greater than 80
22 degrees C or whatever the qualification temperature
23 is.

24 With that --

25 MR. CIOCCO: Well, then, finally we had

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1 what we talked about earlier, what we consider one of
2 our technical challenges was the US-APWR uses the gas
3 turbine generators in lieu of the commonly used diesel
4 generators. We talked about the first-of-a-kind
5 application as a Class 1E source. Therefore, the
6 operating experience has been limited to the non-
7 nuclear applications.

8 In our Phase 2 review, the reliability and
9 the seismic qualification was an open item, and we did
10 go ahead and move forward, because we had very
11 adequate test plans for the reliability testing and
12 the seismic qualification of the gas turbine
13 generators.

14 As we heard earlier, MHI has completed its
15 initial type testing program. We just got Revision 2
16 of the technical report. We will make that available
17 to the ACRS as well once that gets processed into our
18 system and on the docket. It did address the
19 reliability and the seismic qualification testing.

20 We are currently reviewing the results of
21 both of those tests. It is going to be addressed in
22 Phase 4, and the seismic qualification is really
23 handled in Chapter 3 -- I think it's Section 3.3.10 --
24 or we look at the seismic qualification. And so that
25 will be down the road whenever we see the seismic

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1 qualification in Chapter 3.

2 MEMBER SIEBER: I have a question.

3 Typically, the gas turbine generators that have -- the
4 turbine part of it operates at a relatively high speed
5 compared to the generator. You may have a generator
6 at 1,800 rpm, you may have a turbine running at
7 4,800 rpm, you want to start that from zero cold to
8 4,800 rpm hot in 90 seconds, something like that,
9 which puts a lot of strain on the blades, by the way.

10 When you're running the seismic test, do
11 you run it with the unit shutdown or operating?
12 Because clearance interference when it's shut down
13 will not result in the failure of the turbine. On the
14 other hand, clearance interference when it's running,
15 you may have blade rubs, blade vibrations, which cause
16 failure. So which way do you do that, and how do you
17 justify the occurrence of a seismic event while the
18 gas turbine generator is already started and running?

19 MR. CIOCCO: Is that an MHI -- we're just
20 looking at the results right now. The testing --

21 MEMBER-AT-LARGE STETKAR: We saw that --
22 I don't recall -- the video that they presented, I
23 don't recall whether the gas turbine was operating or
24 whether it was --

25 VICE CHAIRMAN ARMIJO: I thought it was

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1 operating.

2 MEMBER-AT-LARGE STETKAR: I don't recall
3 it operating, but I'd like to hear that from MHI.

4 MR. KAWANAGO: This is Shinji Kawanago
5 from MNES. We conducted several test conditions, and
6 one is -- at first, in shaking a table and gas turbine
7 generator and don't start and starting -- and push
8 starting and aborting and a gas turbine generator
9 starting.

10 And the other mode is in a gas turbine
11 generator have already started. And after that,
12 shaking a table.

13 MEMBER BLEY: Was it fully loaded?

14 MR. KAWANAGO: Yes, it's fully loaded.

15 MEMBER SIEBER: Okay. So it is operating
16 when you do the test.

17 MR. KAWANAGO: I'm sorry. I'm sorry. It
18 was without.

19 MEMBER SHACK: You ran it two ways -- one
20 when it started the shaking, and then started the
21 generator; and the other one while it was running, and
22 they started it.

23 MEMBER SIEBER: That satisfies my concern.
24 Thank you.

25 MR. KAWANAGO: You're welcome.

1 VICE CHAIRMAN ARMIJO: Just a quick
2 question. I may have asked this before in one of the
3 Subcommittee meetings. In the -- will the first
4 application of the gas turbine generator be in, let's
5 say, a plant in Japan that may be under construction?
6 I don't know. Or will it be the first application in
7 a U.S. --

8 MEMBER BLEY: Are they even running
9 anywhere?

10 VICE CHAIRMAN ARMIJO: Well, they say at
11 non-nuclear --

12 MEMBER BLEY: Sure.

13 VICE CHAIRMAN ARMIJO: -- but in a nuclear
14 plant, is there plans to build and operate this type
15 of plant in Japan?

16 MR. CIOCCO: I think MHI will answer.

17 MR. KAWANAGO: I'm Shinji Kawanago. When
18 we talk about the commercial nuclear -- commercial
19 nuclear powerplant, including Japan, this is a first
20 application. However, in Japan, we had an application
21 for the gas turbine generator to the -- in a nuclear
22 powerplant. But that is actually the commercial --
23 commercial nuclear powerplant. It's a test nuclear
24 powerplant in Japan. So this is including just an
25 experiment, and this one is second application.

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1 VICE CHAIRMAN ARMIJO: What was that
2 plant, the test plant?

3 MR. KAWANAGO: It's actually the Tol kai.
4 It's Tol kai -- I'm sorry, I don't remember the actual
5 name. And also, and when we talk about recycled fuel,
6 we have already applied the gas turbine generator. So
7 the -- if we tell all this in a -- you expand the
8 scope of the nuclear-related facility, we have already
9 applied to gas turbine as a safety -- as the safety --
10 as safety and emergency power supply system.

11 VICE CHAIRMAN ARMIJO: Okay. Thank you.

12 MR. CIOCCO: That concludes my
13 presentation this morning.

14 MEMBER-AT-LARGE STETKAR: Do Committee
15 members have any other questions for the staff?
16 Comments?

17 (No response.)

18 Nothing. Jeff, thank you very, very much.
19 Appreciate it. Thank you.

20 Do we have any questions or comments from
21 any members of the public?

22 (No response.)

23 If not, I would like to thank both MHI and
24 the staff for presentations and fielding our
25 questions. And, Mr. Chairman, I will turn it back to

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1 you.

2 CHAIRMAN ABDEL-KHALIK: Thank you. We are
3 half an hour early. But at this time, we are off the
4 record. We will take a 15-minute break. We will --
5 at that -- when we return, we will pick up the next
6 item on the agenda, which is the P&P report. We will
7 reconvene at 10:15.

8 (Whereupon, at 10:00 a.m., the
9 proceedings in the foregoing matter went
10 off the record.)
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US-APWR
Design Certification Application
Chapter 2, 5, 8, 10, 11, 12, 13, 16

**ACRS Full Committee Presentation
September 9, 2011
Mitsubishi Heavy Industries, Ltd.**

Introduction



- **The US-APWR basic design concept is the same as conventional 4 loops PWR plant.**
- **Significant unique features of US-APWR are as follows:**
 - **Advanced Accumulator – future discussion as part of Chapter 6**
 - **Digital I&C Platform – future discussion as part of Chapter 7**
 - **Emergency Gas Turbine Generator (GTG) – discussion included as part of Chapter 8**

Chapter 2: Site Characteristics



- **Geological, Seismological, Hydrological and Meteorological parameters are addressed.**
- **COLAs confirm site characteristics are bounded, or provide site-specific qualification.**
- **No issues to be discussed.**

Chapter 5: Reactor Coolant and Connecting Systems



- Addresses the integrity of the Reactor Coolant Pressure Boundary, which consists of the Reactor Vessel, Reactor Coolant Pumps, Steam Generators and Subsystems.
- No issues to be discussed.

Chapter 8: Electric Power



- **Offsite Power System, Onsite Power Systems, AC Power Systems, DC Power Systems and Station Blackout are addressed.**
- **Class 1E GTGs are applied as the emergency power source.**

Chapter 8: Electric Power (Continued)



- **Specification for GTG**
 - ✓ **Class 1E, Seismic Category I**
 - ✓ **Rated Output: 4500 kW**
 - ✓ **Starting time: less than 40 sec.**
 - ✓ **Starting System: air**
- **MHI performed qualification tests (initial type tests and seismic tests) based on IEEE 387-1995.**

Chapter 8: Electric Power (Continued)



➤ Qualification Tests

✓ Initial Type Tests (Sep. to Dec. 2010)

- Load Capability Test, Start and Load Acceptance Test, and Margin Test
- Test results are shown in the Technical Report MUAP-10023 R2.

✓ Seismic Tests of Gas Turbine Engine (Mar. to Apr. 2011)

- Testing consists of 5 OBE and 2 SSE tests using the DCD Required Response Spectra (RRS).
- Test results are shown in the Technical Report MUAP-10023 R2.

➤ Major RAIs

- ✓ Reliability: MHI has reported reliability evaluation details in the Technical Report MUAP-10023 R2.
- ✓ Diversity: MHI has committed to use different manufacturers for the Class 1E GTGs and the AAC-GTGs.

Chapter 10: Steam and Power Conversion System



- **Turbine Generator, Steam and Power Conversion Systems are addressed.**
- **No issues to be discussed.**

Chapter 11: Radioactive Waste Management



- **Liquid, Gaseous and Solid Waste Management Systems are addressed.**
- **No issues to be discussed.**

Chapter 12: Radiation Protection



- Radiation Sources, Radiation Protection Design Features and Dose Assessment are addressed.
- No issues to be discussed.

Chapter 13: Conduct of Operations



- Information relating to the preparation and plans for the US-APWR plant design, construction, and operation are addressed.
- No open items and no issues to be discussed.

Chapter 16: Technical Specifications



- Safety limits, limiting safety system settings, LCOs (Limiting Conditions for Operation), surveillance requirements, design features and administrative controls are addressed.
- No issues to be discussed.



Thank You



United States Nuclear Regulatory Commission

Protecting People and the Environment

Presentation to the ACRS Full Committee – 586th Meeting

US-APWR Design Certification Application

**Safety Evaluation Report with Open Items
for**

Chapters 2, 5, 8, 10, 11, 12, 13, and 16

Jeffrey Ciocco

US-APWR Design Certification Lead Project Manager

September 9, 2011

Agenda

- US-APWR Design Certification licensing overview.
- Summary of Safety Evaluation Reports (SER) with Open Items.
- Summary of Technical Challenges.

US-APWR Design Certification

Major Milestones Chronology



DATE	ACTION
07/13/2006	Pre-application activities began
12/31/2007	Design Certification Application Submitted
02/29/2008	Application accepted for review (docketed)
08/29/2008	Design Control Document Revision 1 submitted
06/19/2009	Phase 1 review completed
10/27/2009	Design Control Document Revision 2 submitted
May 2010 – August 2011	Phase 2 and Phase 3 reviews completed for Chapters 2, 5, 8, 10, 11, 12, 13, and 16.
03/31/2011	Design Control Document Revision 3 submitted

US-APWR Design Certification Review Schedule



TASK DESCRIPTION	COMPLETION DATE
Phase 1 – Preliminary Safety Evaluation Report (SER)	Completed
Phase 2 – SER with Open Items	January 2012
Phase 3 – ACRS Review of SER with Open Items	May 2012
Phase 4 – Advanced SER with No Open Items	October 2012
Phase 5 – ACRS Review of Advanced SER with No Open Items	January 2013
Phase 6 – Final SER with No Open Items	May 2013
Rulemaking	October 2013

Summary of Chapters 2, 5, 8, 10, 11, 12, 13, 16 SER with Open Items



- To-date, eight SERs with Open Items for Chapters 2, 5, 8, 10, 11, 12, 13, and 16 have been issued and presented to the US-APWR ACRS Subcommittee.
- The staff issued many RAIs questions which resulted in a number of Open Items.
- There are no significant technical issues.

Summary of Technical Challenges

Chapter 8 Electric Power



- The US-APWR uses Gas Turbine Generators (GTGs), as Emergency Power Supply in lieu of the commonly used Diesel Generators.
- This is a first-of-a-kind application of GTG to Class 1E sources in nuclear plants, therefore the operating experience is limited to non-nuclear applications.
- Two issues related to the GTG are the reliability and seismic qualification.

Summary of Technical Challenges

Chapter 8 Electric Power (cont'd)



- MHI has completed the Initial Type Test Program for the GTG reliability and the seismic qualification testing.
- NRC staff is currently reviewing the results of the Initial Type Test Program.
- GTG reliability will be addressed in Phase 4 of the Chapter 8 review.
- GTG seismic qualification will be addressed in Chapter 3.