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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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US-APWR SUBCOMMITTEE

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WEDNESDAY, AUGUST 17, 2011

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ROCKVILLE, MARYLAND

The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., John W. Stetkar, Chairman, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

JOHN W. STETKAR, Chairman

J. SAM ARMIJO

SANJOY BANERJEE

DENNIS C. BLEY

CHARLES H. BROWN, JR.

DANA A. POWERS

HAROLD B. RAY

JOY REMPE

WILLIAM J. SHACK

NRC STAFF PRESENT:
ILKA BERRIOS, Designated Federal Official
JEFF CIOCCO
HOSSEIN HAMZEHEE
DAVID TERAO
DEVENDER REDDY
JOHN HONCHARIK
BOB DAVIS
PAUL KALLAN
DINESH TANEJA
ANGELO STUBBS
STEPHEN MONARQUE
GREG MAKAR

ALSO PRESENT:
ATSUSHI KUMAKI
YOSHIHIRO MINAMI
RYAN SPRENGEL
SCOTT KIPPER
HIROSHI HAMAMOTO
HIROSHI SHIRASAWA
NAOKI KAWATA
KOICHIRO YAMAMOTO
NOBUO ISHIHARA
DON WOODLAN

ALSO PRESENT:

TIM CLOUSER

JOHN CONLY

TODD EVANS

JOE TAPIA

RICHARD BARNES

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

8:30 a.m.

CHAIR STETKAR: The meeting will now come to order. This is a meeting of the United States Advanced Pressurized Water Reactor Subcommittee.

I am John Stetkar, Chairman of the Subcommittee meeting.

ACRS members in attendance are Harold Ray, Dana Powers, Sam Armijo, Bill Shack, Charlie Brown and Joy Rempe. Ilka Berrios of the ACRS staff is the Designated Federal Official.

The Subcommittee will review Chapter 10, Steam and Power Conversion System of the Safety Evaluation Report with open items associated with the US-APWR Design Certification and Chapter 8, Electric Power and Chapter 10, Steam and Power Conversion of the SER with open items associated with the Comanche Peak Combined License Application.

We'll hear presentations from the NRC staff, Mitsubishi Heavy Industries, Luminant Generation Company and Mitsubishi Nuclear Energy Systems, and I see we've been joined by Dr. Dennis Bley, also as a member.

We've received no written comments or requests for time to make oral statements from members

of the public regarding today's meeting.

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

The rules for participation at today's meeting have been announced as part of the notice of this meeting previously published in the Federal Register.

Parts of this meeting may need to be closed to the public to protect information proprietary to MHI, MNES, Luminant or other parties.

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

So, if we need to close the meeting for anything proprietary, just alert us to that, please.

A transcript of the meeting is being kept and will be made available, as stated in the Federal Register Notice. Therefore, we request that participants in this meeting use the microphones located throughout the meeting room when addressing the Subcommittee.

The participants should first identify themselves and speak with sufficient clarity and volume, so that they may be readily heard.

We will now proceed with the meeting and I call upon Jeff Ciocco to begin.

MR. CIOCCO: Yes, good morning. My name is Jeff Ciocco. I'm the lead Project Manager for the US-APWR Design Certification.

Sitting next to me is my Branch Chief Hossein Hamzehee of our US-APWR Projects Branch.

We're here today, with the NRC staff, to present Chapter 10 of our Design Certification Document and our Safety Evaluation Report, with open items, Steam and Power Conversion System.

We'll continue with our staff introductions, as we present our Chapter 10 Safety Evaluation Report, after the MHI presentation. Thank you.

CHAIR STETKAR: Thanks a lot, Jeff, and I guess we'll turn it over to MHI.

MR. MINAMI: Thank you.

MR. KUMAKI: This is Atsushi Kumaki MHI. I am DCD manager of the US-APWR project.

We'd like to present today, for about Chapter 10 with the people coming from Japan, and so,

I'll like to turn over the microphone, Mr. Minami.

MR. MINAMI: Okay, shall I get started, my presentation?

CHAIR STETKAR: Yes, good.

MR. MINAMI: Okay, I will make the presentation about Chapter 10 Steam and Power Conversion Systems.

My name is Yoshihiro Minami, one of the lead presenters of this Chapter 10, and Scott Kipper, next to me, is also a lead presenter, and I will be responsible for Chapter -- Section 10.1 and 10.2, and Scott will be responsible for the remaining part of Section 10.3 and 10.4.

Okay, and let me introduce myself. I am a steam turbine engineer and I began working for Mitsubishi in 1980, and I was mainly involved in the basic design of the steam turbine for the nuclear power station.

The next three slides include the explanation of acronyms. I don't think it is necessary to explain about these acronyms, so, I will skip to page five.

Page five, okay, and Chapter 10 consists of four sections, 10.1 to 10.4, and 10.1 gives summary description of design features of steam and power

conversion systems, and Section 10.2 is turbine and generator, and Sub-Section 10.2.1 gives design basis and Section 10.2.2 gives design description, general description, component description and the description of the turbine control and the turbine protection system.

And Section 10.2.3 is one of the major parts of our DCD, in explaining the turbine control and turbine protection system, and we received many RAI's from the NRC, and as a result of the face-to-face meeting with MHI and NRC, all of the RAI's are closed at this moment for -- yes?

CHAIR STETKAR: Continue.

MR. MINAMI: Okay.

CHAIR STETKAR: If you're finished, let me just ask the staff, will we discuss the turbine missile analysis in Chapter 3, or if not, when we will discuss the turbine missile analysis?

The reason I ask is, there is a lot of discussion about turbine protection and turbine control in Chapter 10, but as I read the SER, it sounds like the actual turbine missile analysis is evaluated as part of Chapter 3, is that correct?

MR. HAMZEHEE: I think you are right. I don't believe today, we're going to talk about turbine

missile. Let me re-confirm it with the tech staff.

MR. TANEJA: This is Dinesh Taneja. Chapter 3 has turbine missile analysis.

CHAIR STETKAR: Okay.

MR. TANEJA: Chapter 10 has turbine rotor integrity.

So, we will talk about the turbine rotor integrity, as part of Chapter 10.

CHAIR STETKAR: Okay, so --

MR. TANEJA: Yes, there is a link.

CHAIR STETKAR: Yes, I recognize the link, I just don't -- what I want to avoid is duplicating questions or taking too much time with questions about turbine protection, turbine control functions today, when in deed, a lot of those discussions are more relevant to the turbine over-speed and turbine missile analysis.

So, I just want to make it clear, and I also don't want those questions to be lost in the gap between Chapter 10 and Chapter 3.

So, I just want to make it clear, when is actually the most appropriate time to ask about those?

MR. REDDY: Dr. Stetkar, my name is Devender Reddy. I am presenting the control systems and the hydraulic systems.

CHAIR STETKAR: Okay.

MR. REDDY: But I spotted the missile -- the missile probabilities concern, it will be presented in Chapter 3.

CHAIR STETKAR: In Chapter 3?

MR. REDDY: Yes.

CHAIR STETKAR: Okay, thanks.

MR. HONCHARIK: This is John Honcharik, and the turbine missile analysis will be in Chapter 3.

CHAIR STETKAR: Okay.

MR. HONCHARIK: The rest of it is --

CHAIR STETKAR: I was concerned that I was going to give Chapter 10 --

MEMBER BLEY: I'm just curious on where does that leave us? If we don't pursue the questions today, will the right people be here when we get to that one, who know about the -- that includes the controls.

CHAIR STETKAR: That is one of the reasons that --I don't want to duplicate effort, but I want to make sure that both MHI and the staff know to have the correct people available at the appropriate time.

We've run into this before, where we've asked questions in one chapter and have been pushed off to the other chapter, and then when we start

asking the questions in Chapter 3, we don't have the appropriate people with knowledge of the equipment or the analysis.

MEMBER BROWN: But John, they are covering turbine controls, the over-speed trips and things like that. That should be covered in this. At least, it's in the chapters.

CHAIR STETKAR: Yes, I mean, the physical configuration.

MEMBER BROWN: Okay, yes.

CHAIR STETKAR: But not necessarily, how they're evaluated in the --

MEMBER BROWN: Okay, but that's a key piece of --

CHAIR STETKAR: -- as part of the turbine missile analysis.

MEMBER BROWN: -- on the controls and protection systems.

CHAIR STETKAR: That's right.

MEMBER BROWN: Okay.

CHAIR STETKAR: And I just want to make sure that we don't drift off into turbine over-speed analyses, when we don't -- you know --

MEMBER BROWN: And strengthen from the material integrity standpoint.

CHAIR STETKAR: -- when that is not an appropriate topic, okay.

Thank you, I'm sorry for the interruption. That was just clarification, to make sure that we understand where each of the topics will be covered.

MR. MINAMI: So, I will continue my explanation, and so, at this moment, we don't have any open items in this Section 10.2.2.3 of turbine control and turbine protection systems.

But we still have one confirmatory item to incorporate into RAI, this points to the NRC, to DCD, to the next three parts in it.

Sub-Section 10.2.2.3 deals with turbine rotor integrity, and MHI gave many RAI questions on this item to the NRC, and we understand that there are still four open items in this sub-section, and in addition to those four open items, we have one other -- one open item related to the ITAAC table.

So, we have five open items in total, in this Section 10.2, and the Section 10.3 defines main steam and the supply system, and MHI does not have any open item in this section, but there are three confirmatory items in Sub-Section 10.3.6, and those three confirmatory items will be explained in this presentation later by Scott.

And Section 10.4 deals with other features of steam and power conversion systems, and this section includes various kinds of systems which support efficient, desirable and safe operation of the secondary systems, and the MHI does not have any open items or confirmatory items in this Section 10.4.

Okay, let me start the explanation of the Section 10.1 summary description, this slide shows the overall system diagram of the US-APWR.

We have four steam generators and those four steam generators supply main steam to the high pressure turbine, through the main steam supply systems, and main steam is expanded in the high press turbine and exhausted to the -- to the two moisture MS/R, and the steam being re-heated to the super-heated condition.

It's supplied to the three low pressure turbine, through the cross-over-piping, and we have three condensers on the low pressure turbine and the steam is -- expanded steam is condensed to the water by a cooling water -- by the condenser, and cooling water system will supply the cooling water to the condenser.

And under the condensed water, will be returned to the steam generator, through the low

pressure feedwater heaters, and the high pressure feedwater heaters.

In addition to the main system, we also have emergency feedwater systems and steam generator blow-down systems.

And all the equipment installed in the turbine building is non-safety-related equipment, and all the equipment installed in the reactor building is -- are all safety related equipment.

And there is no major difference -- there is no major difference in the overall systems of the US-APWR from the existing, almost -- this system is almost same to the existing system.

And this table shows a design feature and the rated NSSS power is for the 4,466 megawatt thermal, and main steam pressure of the steam generator is 957 psig, and the total steam flow rate from the SG's is about 20-million pounds per hour, and steam turbine type is compound is six flow at the last stage rate ranks of the low pressure turbine is 74 inches.

And rotating speed is 100 -- or 1800 RPM, and generator output is expected to be 1,625 after the turbine back pressure 2.6 inHgA, and as for the generator, the generator capacity has 1,900 MVA and

the design is a power factor of 0.9.

Okay, and this picture shows a configuration of steam turbine generator MS/R and the main steam is supplied to the high pressure turbine through the main turbine stopper and main turbine control valve, which rotated on both sides of the HP turbine.

And high pressure turbine is of double-flow design and expanded to both sides, double side and the generator side, and exhausted to the two MS/R through the fixed cross-over piping, and after reheated in the MS/R, moisture separator re-heater, super-heated steam, it's supplied to three low pressure turbine. Low pressure turbine is also of double-flow design.

And one pair of -- the heat stopper and intersect bar is installed on each cross-over piping and as I explained, the rest stage grade ranks of the low pressure turbine is 74 inches to enhance the efficiency of the steam power.

And low pressure turbine, a high pressure turbine rotor and a low pressure turbine rotor is monobloc rotors, the machine is out from one big forging, and so, the solid rotor, without center bore will be applied with both high pressure and low

pressure turbine.

CHAIR STETKAR: I know there is some questions, and I'm not our materials expert, so, I will keep looking to my right here, to make sure I don't step on myself too badly.

I read several questions that the staff had about the fact that you're proposing a solid core rotor --

MR. MINAMI: Right.

CHAIR STETKAR: -- without a center bore. Has that issue been resolved?

I though the staff was advocating a bored rotor for the ability for sampling the central core of the rotor materials.

You just mentioned that it will be a solid rotor, is that correct?

MR. MINAMI: Right.

CHAIR STETKAR: Okay, we're going to hear from the staff regarding that?

MR. HAMZEHEE: Yes.

CHAIR STETKAR: Okay, thank you.

(Off the record comments)

MR. MINAMI: Okay, and this slide shows the design basis for turbine generator, and the turbine generator itself is a non-safety related

system.

But the turbine generator could be a potential source of high energy material, which could cause damage to safety related equipment or the systems.

And due to the reason of the above turbine and the control protection systems are designed, so that turbine missile generation probability satisfies the requirement of SRP which is less than one times 10 to the negative five per year.

MEMBER POWERS: How do you know that?

MR. MINAMI: I'm sorry?

MEMBER POWERS: How do you know that?

MR. MINAMI: The probability of the --

MEMBER POWERS: Yes, how do you know that?

MR. MINAMI: We already finished our calculation of the turbine missile generator --

MEMBER POWERS: The question is, how do you know that?

I mean, you say it's one times 10 -- it's less than one times 10 to the minus fifth per year. How do you know?

MR. MINAMI: How?

MEMBER POWERS: I mean, have we busted up enough turbines to have a statistical distribution?

Three does not constitute a statistical distribution.

CHAIR STETKAR: No, no, no, this is -- the reason I asked the question going into this meeting is, I think there will be substantial questions about the turbine missile analysis and the basis for that 10 to the minus five, and the question is whether MHI and the staff have the appropriate people here today, to answer those questions, or whether we're going to approach those questions during Chapter 3, and what I was hearing is, Chapter 3 is the appropriate time to ask those.

MEMBER POWERS: You're telling me to shut up?

CHAIR STETKAR: No, I am telling you to --

MEMBER POWERS: I'm probably not going to get an answer to that.

CHAIR STETKAR: I'm telling you not -- yes, that's a more truthful, thank you.

But yes, but I think -- you know, in truth, make sure that when you come for Chapter 3, that MHI has your appropriate people here to discuss that turbine over-speed analysis, because we will have significant questions about the basis for that 10 to the minus five number.

So, that's just a warning, you know, a

caution that --

MR. CIOCCO: Can you capture it in your list of items that you keep for this?

CHAIR STETKAR: I don't want to do that. This is just a warning.

We tend to capture specific questions and it's not -- I don't think it's productive in today's meeting, to enter into discussions about details, when we neither have the SER related to that analysis, nor do we necessarily have all of the correct people from either MHI or the staff to answer those questions.

So, my suspicion is that we could ask a lot of questions and just be told, "Well, we'll address those in Chapter 3," so, I'm trying to avoid that time-consuming discussion.

MR. SPRENGEL: This Ryan Sprengel with MNES, and we agree, there is a technical report out there that's specifically on this --

CHAIR STETKAR: Yes.

MR. SPRENGEL: -- tied to Chapter 3. So, we will be prepared.

CHAIR STETKAR: Okay, good, good.

MR. KIPPER: And I'm Scott Kipper with MNES. What we will focus on today are the material properties of the rotor.

CHAIR STETKAR: Yes, and I understand, yes. But the actual over-speed analysis, the evaluation --

MR. KIPPER: That is in Chapter 3.

CHAIR STETKAR: The question that Dr. Powers was asking is, what is the basis for that assertion that the missile generation frequency is less than 10 to the minus five will be addressed in Chapter 3.

MR. KIPPER: Correct.

CHAIR STETKAR: Okay, please continue.

MR. MINAMI: Please take a look at our whole report, but in the DCD, our orientation of the TG is such that a high energy missile would be directed at approximately 90 degrees away from the safety related structure.

Therefore, the TG orientation is favorable in the DCD, and criteria for favorable orientation is one times 10 to the negative four in the SRP.

But we applied conductive criteria in favorable orientation for the variation of the turbine missile analysis and this discussion should be continued in Section 3.

CHAIR STETKAR: Two questions.

MR. MINAMI: Yes.

CHAIR STETKAR: Two questions, and this doesn't relate necessarily to the over-speed analysis, but now, I didn't have a chance to look at the all of the signals.

Does a turbine trip in this design produce a reactor trip directly?

MR. HAMAMOTO: This is Hiroshi Hamamoto.

CHAIR STETKAR: Yes, okay.

MR. HAMAMOTO: Answer is yes.

CHAIR STETKAR: The reason I ask that question is, you make a statement that there is no safety related equipment in the turbine building, and I was curious how the signals for that reactor trip are generated and whether the sensors --

I don't know how they're generated, whether they come off position of the turbine stop-valves or whether they come from pressure in the trip fluid or whether they come from some other sensors, whether those sensors, because they provide a reactor trip input, are considered safety related sensors.

MR. KIPPER: Do we have that information on the sensors?

MR. SHIRASAWA: This is Hiroshi Shirasawa from MNES.

One is discussed in Chapter 7, and the

reactor trip on turbine trip is performed by the turbine stop valves feature and the oil pressure, low oil pressure of turbine.

CHAIR STETKAR: Okay, that's pretty typical.

Your question is, is there a need for those sensors, whether come from the turbine stop valve positions or the oil pressure, to be safety related equipment, because they provide an input to the reactor trip function.

I'll, ask the staff about that, when they come up, also, because it's an important assertion that you make about the fact that there is no safety related equipment in the turbine building that could be affected, either by turbine missiles or by, you know, steam line breaks or any other types of environmental conditions.

MR. KIPPER: And 10.3 and 10.4, I can describe how the main steam systems and our feedwater systems reactor to reactor trips.

CHAIR STETKAR: Right.

MR. KIPPER: And namely, our safe shut-down system is our emergency feedwater system, which is all in the reactor building.

So, ultimately, that is the -- I

understand your question of whether the sensor that initiates a reactor trip needs to be safety related, but the equipment that performs the safe shut-down is all in the reactor building.

CHAIR STETKAR: Understand, thanks.

MR. MINAMI: Okay, let me continue my explanation.

On page 12, yes, as I explained, MHI has five open items in this Section 10.2, but I'd like to focus on three major open items in this opportunity, and the first open item is related to the turbine rotor integrity, and there were two NRC concerns.

The first concern is what type of rotor material should be applied to the US-APWR low pressure rotors, and the second NRC concern is how do the material properties relate to those used in the turbine missile analysis?

And MHI responded to RAI-574, RAI-574 in June last year, and MHI found that this RAI and the question are still open, when we looked at the SER safety evaluation report for the Chapter 10, which was recently released by NRC.

We didn't have much -- we didn't have enough time to discuss with NRC, and we did not give any additional response to NRC.

So, therefore, MHI's RAI response included in this table, are our first response to NRC at the look at the SER from the NRC, and MHI RAI response to the first NRC concern is US-APWR low pressure turbine material.

Is it MHI proprietary material, but is it -- but RAI is equivalent to ASTM A470 Grade C, Class 6.

So, in the next revised DCD we will add a new sentence. We will apply low pressure turbine rotor equivalent to ASTM material, and our RAI response to the second concern of the NRC, how do the material properties relate to those used in the turbine missile analysis?

Specified minimum yield strengths in our specification is used in the turbine missile analysis, and as we will tell you, all of the strengths will be confirmed as part of the ITAAC activity.

And impact strengths, 50 percent FATT. FATT stands for Fracture Appearance Transition Temperature, and are part of NRC reg will be confirmed on the as-built rotors to confirm that the fracture toughness K1C used in the turbine missile analysis is adequate.

MEMBER ARMIJO: How much operating

experience does Mitsubishi have with this material, this proprietary rotor material, in equivalent service to what you're proposing?

MR. MINAMI: We have so many experiences, because basically, low pressure turbine material has not been changed from the starting over or for this steam turbine rotor.

So, but maybe after around 1990, we began applying monobloc rotors and we have so many experience of monobloc rotors, for the LP turbine.

MEMBER ARMIJO: With this --

MR. MINAMI: With this material?

MEMBER ARMIJO: This material?

MR. MINAMI: Right, right.

MEMBER ARMIJO: So, this material has some, perhaps, tighter specifications on chemistry control than the A470, or is it significantly different?

I'm sorry, I didn't look and actually look for the composition.

MR. MINAMI: There are no big difference between all material and ASTM material.

But the specification for the -- if I remember correctly, sulfur and phosphate.

MEMBER ARMIJO: Yes, so, you're tighter on

--

MR. MINAMI: Right, correct.

MEMBER ARMIJO: Okay.

MEMBER SHACK: Well, you have a number of other chemistry differences. I mean, you still have a more restricted chemistry.

MEMBER ARMIJO: Yes, it's really tight, yes. That's what I expected.

MEMBER SHACK: And that's one of the elements.

MR. MINAMI: And page 13 shows second open item, and second open item, please take a look at, on the right of this table and the criteria for 50 percent FATT and Charpy V-notch energy.

In MHI specification is equivalent to those specified in ASTM material, but which is not as conservative as SRP criteria, as you see in the table -- as you see in this table.

Fifty percent FATT, a maximum 50 percent FATT and the minimum V-notch energy of the ASTM material is minus 7 and 67 respectively, while standard specified minus 18 degree ratios and 81, more conservative numbers.

So, NRC concern is how MHI ensure adequate fracture toughness during a start-up and a normal

operations?

And MHI response to NRC concern is right there, fracture toughness tendency after the center core bore -- center core of the actual full integral rotors. Full integral rotors means the monobloc rotors is expected to be greater than 200 ksi square-root inches.

While the much lower number was used, which is decided, based on the MHI specification, so, much lower number is used in the turbine missile analysis.

So, we have many safety margins in the turbine missile analysis. So, the material specification changes, not necessary to supply the turbine missile probability criteria specified in the sum of the rotor prong.

MEMBER SHACK: That puts a great deal of weight then, on the turbine missile analysis and the question of how you get to the one times 10 to the minus five and whether all the uncertainties have been addressed.

So, I guess that is all pushed off, but I mean, you know, you -- because you haven't met the more conservative requirements, you're pushing everything onto the analysis.

MR. MINAMI: Yes, I understand. Maybe we have to have a detailed discussion with NRC, before coming to the ACRS meeting.

MEMBER ARMIJO: Are you going to confirm the 200 ksi root-inch properties, at the center core by sampling in some way?

MR. MINAMI: No, not at center core, because we don't have -- no, we have no bore, no bore.

So, we can't carry out any destructive testing for that.

MR. KIPPER: We do discuss the -- our test methods on the next few slides.

MEMBER ARMIJO: Okay.

MR. MINAMI: And the next slide shows the third open item and the NRC major concern is how does MHI secure the reliability of the third rotor without doing destructive testing at the center bore core region?

And the MHI RAI response is like this, major mechanical properties of the center bore core, of monobloc rotor, full integral rotor, so, that all the mechanical properties are input to supply the minimal value of the specification with 99.7 percent reliability.

So, our experience shows that all the data

satisfy the requirement of specification with reliability, more than 99 percent.

So, at this moment, we think we don't need any destructive testing for center bore core regions, for the new low pressure turbine rotor.

MEMBER SHACK: Again, the question will be, you know, how many rotors do you exam to come up with -- you know, just how you got those numbers.

CHAIR STETKAR: Let me interrupt you for a moment, and ask the members, how should we -- Chapter 3, it's not clear when, in geologic time, Chapter 3 SER will be available to us. It's not an imminent deliverable.

Should we postpone any discussions related to both the material aspects?

There are two technical reports, one on the turbine over-speed, if you will, the protection part of that, and a separate technical report on generation of missiles as a function of speed, these operating conditions.

Should we postpone our discussion of the reliability analysis for that missile generation technical report, until Chapter 3, or should we try to bring that to some measure of conclusion today?

They're related through, you know, the

whole turbine missile analysis.

MEMBER SHACK: Right.

CHAIR STETKAR: Conclusions, finally.

MEMBER BLEY: I'd sure like to see us do it all together, because it gets real awkward and --

CHAIR STETKAR: My sense is that --

MEMBER BLEY: And worse than awkward, things drop out, when you separate them.

CHAIR STETKAR: That is my sense, especially because of the long time lag.

If we were going to be addressing Chapter 3, for example, next month, I would feel less comfortable -- less uncomfortable about it.

But I'd propose to the Subcommittee that, you know, we try to understand as much information about the technical, you know, construction, if you will, of the rotor.

But during the Chapter 3 analysis, make sure you have your materials people here, because basically, what I'd like to do is cover both of those technical reports, that support that eventual 10 to the minus five type number in Chapter 3. It's just a lot easier for us to treat it as a whole, you know.

MR. HAMZEHEE: I think I agree with everything you said, based on your preference, we'll

prepare ourselves.

But it's better to have it under Chapter 3 when the staff and the Applicants are ready to come and talk about it.

But one thing that would help the staff and Applicant is, if there are some specific areas that you would like to know, let us know ahead of the time, so, we can go ahead and make sure that we don't miss any of those areas, when we're ready to discuss Chapter 3, unless you want us to just --

MEMBER BLEY: That's going to be hard, but I mean, it's essentially, the justification for each step of the analysis.

MR. HAMZEHEE: Sure, yes.

CHAIR STETKAR: I mean, it's basically, those two technical reports, if you will.

There is two technical reports, one that supports essentially, the materials side of the problem, the other that supports the trip reliability, if you will, side of the problem.

MR. HAMZEHEE: Yes, but what I -- yes, but what I meant was if, based on your interactions in the last year or so, there are some areas that may or may not be in those reports, but you would like to have some additional discussion, let us know and we'll make

sure we include them in our presentation. That is what I meant.

CHAIR STETKAR: Okay.

MR. HAMZEHEE: In addition to going through all the basic steps and all the justifications for the numbers and conclusions.

CHAIR STETKAR: Okay, I think today it's pertinent to kind of -- you know, if any of the members, that are materials members, have specific concerns about the material properties that are being presented or perhaps, and as Sam asked, operating experience with these types of materials, that is certainly relevant.

But you know, if we start drifting over into that 99.7 percent reliability or 10 to the minus five numbers, I'll try to steer us back to Chapter 3, there. Continue, thank you.

MR. MINAMI: Okay, yes, let me have one comment, and as for the number of material, something I'm ready to explain this time.

But my explanation will include MHI proprietary information. So, if we have -- if I have chance to --

CHAIR STETKAR: Close the meeting?

MR. MINAMI: -- show you in closed

meeting, I will explain that.

CHAIR STETKAR: Okay, we'll try to be sensitive to that.

MR. MINAMI: Okay.

CHAIR STETKAR: And if we do have questions there, there is no problem closing the meeting.

MR. MINAMI: Okay.

CHAIR STETKAR: It's just a matter of logistics and making sure that --

MR. MINAMI: Okay.

CHAIR STETKAR: -- we have the appropriate controls in place.

MR. MINAMI: Thank you.

CHAIR STETKAR: Sure.

MR. MINAMI: And next slides shows major RAI's related to the turbine control and protection systems -- turbine rotor integrity.

And the NRC concern is specific non-destructive testing, and that can detect defect at the center core regions, and MHI reply is 100 percent UT inspection after periphery machining of the rotor will be carried out to define initial internal defect size and the rotations.

So, we will carry out 100 percent UT

inspection during the manufacturing processes.

Next slide, please. Yes, this slide is -- this slide shows a major RAI, related to the control and the protection functions of the turbine -- of the turbine, and as I explained, we received many RAI's regarding this turbine control and protection system from the NRC.

But the NRC and MHI had a face-to-face meeting in November, last year, at the NRC office, and at that opportunity, we provided simplified schematic diagram of the turbine control system for easy understanding of our system, which shows what parts are independent and what parts are shared between turbine control system and electric over-speed trip system and the mechanical over-speed trip system, and we also provided instruction on the terms of arrangements, at that time.

And as a result of the discussion with NRC, all of the RAI's are closed, but we need to incorporate NRC comment and our RAI response to the next revised DCD, at least in this table.

MEMBER BROWN: Before you leave this, I guess I didn't have RAI-4754. I did have the previous one, 2171. I don't know whether it's the right number or not. But 2141, excuse me, 237-2141.

So, when I read 2141, it had one logic diagram in it, for the over-speed trip. Didn't have the other one, and now, that I've read some of this, C-21 -- this one says, you're going to incorporate figures into the DCD, now, showing each of those specific systems, the digital, electro-hydraulic separate, the throttle control system, and then the over-speed -- electrical over-speed will be a separate diagram, indicating and showing that they are totally independent.

Okay, and then you've got the mechanical over-speed trip on top of that. So, those are not in the DCD, yet?

MR. MINAMI: Not yet.

MEMBER BROWN: Okay, I guess for the staff, if I could get a copy of this RAI, just for information, so, I can see what they look like and just kind of take it at face value, right now, that all of that stuff looks okay.

One other question I had, that didn't seem to be answered in the RAI, in the SER, anyway, of the discussion of this, was the platform for the digital electro-hydraulic and the platform for the -- and I may have missed this, for the turbine over-speed trip system.

Is that a MELTAC platform in both cases?

MR. MINAMI: Right.

MEMBER BROWN: Okay, so, you haven't -- so, the basic operating system is the same for both of them, and one just doesn't control anything, other than tripping the other one, okay.

They are separate sensors for each of the two systems. That is the other thing I now gathered out of reading the SER, again. Is that correct, also, they don't share sensors for the electrical parts, between the control and the electrical over-speed, is that correct?

MR. MINAMI: Sensor is different. Sensor is --

MEMBER BROWN: Sensors are different?

MR. MINAMI: Yes.

MEMBER BROWN: Okay, that is -- you've answered my questions, then. I'm finished, John. Thank you. I'll defer anything else until after I see the follow up RAI. Is that satisfactory, John?

CHAIR STETKAR: Yes, that's fine.

MEMBER BROWN: Okay.

CHAIR STETKAR: We can --

MEMBER BROWN: I don't want to -- until I see what they've actually already done.

CHAIR STETKAR: You know, I'm anticipating that when we look at that turbine over-speed analysis, at that time, naturally, some of the details of the trip functions, both the sensors, how the signals are processed, what they do after the signals come out --

MEMBER BROWN: Yes, well, they've got an explanation of that.

CHAIR STETKAR: You know, that would be part of --

MEMBER BROWN: They've got an explanation, relative to the --

CHAIR STETKAR: -- that will be part of what we'll ask about.

MEMBER BROWN: -- controls, okay, all right.

CHAIR STETKAR: So, we'll have a -- you know, basically, I'm saying, we'll have another shot at sort of the configuration of those trip circuits in Chapter 3.

MEMBER BROWN: Okay, all, right, well, I will wait until --

CHAIR STETKAR: Even before we get to Chapter 7, if the --

MEMBER BROWN: Yes, they talk about something being in Chapter 7, and I haven't gone back

and looked at Chapter 7, yet.

CHAIR STETKAR: Okay.

MEMBER BROWN: I got bogged down in the several hundred pages of this stuff. Thank you.

MR. KIPPER: Again, to introduce myself, I am Scott Kipper with MNES. I am a plant systems engineer who works on safety systems and also, supports secondary and auxiliary systems.

I will move into 10.3, which is the main steam supply system, and then also go through 10.4, which is other features of the steam and power conversion system.

CHAIR STETKAR: Scott, before you get into details of piece-parts on this drawing here.

MR. KIPPER: Yes.

CHAIR STETKAR: Could I bring you back to you slide number eight, that shows the overall configuration of -- there you go, the system.

There is a section of the main stream -- main steam supply piping and feedwater piping in the reactor building between the containment and the turbine building, and in the design certification, it's my understanding that that area is designated as a break exclusion zone.

MR. KIPPER: Yes.

CHAIR STETKAR: And I'm curious what a break exclusion zone means.

Does that mean that attorneys have dictated that the break shall not occur there? Does it mean that breaks are absolutely impossible in that region? Does it -- I'm curious about what that means.

MR. HAMAMOTO: This is Hiroshi Hamamoto.

That is only for the discussion. We exclude the -- the discussion is our steam piping and feedwater piping, it's only to go straight area, then to something like that.

We calculate the storage of all piping and we don't consider such -- or such piping does not need to rupture conditions. That is in the discussion in Chapter 3.

CHAIR STETKAR: That's Chapter 3?

MR. HAMAMOTO: Yes.

CHAIR STETKAR: I do note for the record, number one, we'll ask about this in Chapter 3, then. This will be on our list, to make sure that we --

MEMBER BLEY: But before you go on --

CHAIR STETKAR: And I was going to note that perhaps, the main steam and feedwater piping itself may be straight, but there seemed to be a large number of values and attachments, for example, for all

of the safety valves, the relief valve risers, the main steam isolation valves, the main steam isolation bypass valves, drain lines that are attached to that piping in that particular area.

So, I'm curious how breaks and the effects of breaks in all of that equipment, either valves or piping sections, have been evaluated and why they can't occur there.

So, we'll -- if that is appropriate for Chapter 3, we'll ask, but if you want to telegraph, that's a question.

Dennis, did you have anything more, there?

MEMBER BLEY: That's good.

CHAIR STETKAR: Okay, that's -- okay, now, you can talk about the piece parts.

MR. KIPPER: Okay, if we move back to slide 18, this is the overview of the main steam system, which is the section which provides steam from the steam generators through containment and the reactor building in the area you just discussed, and supplies it to the high pressure turbines and the moisture separator and re-heaters, and also, includes branch lines to the emergency feedwater turbine driven pumps.

The main steam supply system does perform

safety related functions, namely it performs containment isolation through its isolation valves and bypass isolation valves.

Also, the main steam safety valves and the main steam relief valve block valves function, to perform containment isolation.

The main steam isolation valves themselves in the bypass isolation valves perform the main steam line isolation and they also provide over-pressure protection of the steam generator through -- we have -- this is a four-loop plant.

So, we have four trains of six main steam safety valves each. Their total rated flow is 105 percent of the rated steam flow.

It also -- the main steam system also reduces and restricts the -- any radioactive release during steam generator tube ruptures through -- we have a safety related main steam depressurization valve, which is a motor operated valve on each of the main steam lines, that is our safety related control valve, and in conjunction with the emergency feedwater system, this will work to provide decay heat and sensible heat removal from the RCS during safe shut-down.

The main steam system also supplies two of

our emergency feedwater pumps that are turbine driven. Those are discussed later in 10.4.

CHAIR STETKAR: Before you -- well, let's go back to the drawing, because now, at least I'm going to start talking about piece-parts.

MR. KIPPER: Okay.

CHAIR STETKAR: Main steam relief valves, are they safety related or not?

MR. KIPPER: The main steam relief valves are not safety related.

CHAIR STETKAR: Not safety related?

MR. KIPPER: Our depressurization valve is.

CHAIR STETKAR: Okay, in the interest of time, then, I'll just focus on the main steam depressurization valves.

It's my understanding that those are -- they're ac-motor-operated valves, but they're actually supplied by inverters from the safety related dc-system, is that correct?

MR. KIPPER: That is correct.

CHAIR STETKAR: Okay, if -- and I understand that the rated lifetime of the safety related batteries is two hours, is that correct?

MR. KIPPER: That is correct.

CHAIR STETKAR: That is correct, okay. Does the rating of the batteries, and I recognize this is an electrical question, but you might have some information.

If the operators, for example, decide to cool down during the two-hour period, if they only have battery power, does the rating of the batteries account for the amount of current that would be drawn by the main steam depressurization valves, because the operators would need to actually operate those motors, to effect a controlled cool-down?

They can't just open them and leave them open, because you'll cool down too quickly.

MR. KIPPER: Right.

CHAIR STETKAR: You need to travel them, you know, as a function of whatever your cool-down rate is, and that will affect the amount of current that those motors draw which, you know, in principle, will affect the life, the rated life of the battery.

So, the question is, does the analysis account for the fact that the operators may effect a cool-down during a nominal station Blackout period, when you only have the batteries available?

If it doesn't, if the safety analysis and the analysis of the batteries doesn't account for

that, do you instruct the operators actively, that they shall not perform a cool-down during a station Blackout, because that is not necessarily the best condition for pressurized water reactor?

MR. KIPPER: Yes.

CHAIR STETKAR: So, it's kind of an involved process, and I'm trying to understand the design of the system, how the operators are instructed to operate the system and what could be anticipated under these two-hour station Blackout conditions.

MR. HAMAMOTO: This is Hiroshi Hamamoto. In the US-APWR, the design --the process -- steam is viewed, as is described in Chapter 8.

Basically, we consider using the AAC region one, now. So, the -- using the AAC, in SBO state, we only -- only to keep the -- hope to stand by quench.

That is the present US-APWR consideration. But for that, your question, what is occurring is not considered in the present US-APWR design.

CHAIR STETKAR: Well, if -- and I sort of understood that. I've read enough to understand that.

I wanted to get a few things on the record, but if that is the case, how do you ensure that the operators will not cool-down?

You know, are the operators explicitly instructed that, "You shall not cool-down, if you have a station Blackout," because that violates some assumptions in the safety analysis?

Most operators are trained generally in a station Blackout, to avoid high pressure conditions, to cool-down and depressurize, if it's possible to do that.

So, I'm curious if that is a fundamental change in emergency operating philosophy on this plant, compared to emergency operating guidance on other plant designs.

MR. HAMAMOTO: Just a moment. So, basically, based on the US-APWR design base, we will provide that emergency operating manual in such a manual to include our basic operation.

But open to such design, we need to consider that design basis, standard basis. We need to discuss about such conditions.

CHAIR STETKAR: Okay.

MEMBER ARMIJO: I'd like to get a quick -- how much more battery capacity would you need to be able to cool down, in addition to, you know -- if you had to -- if you wanted to be able to do that, are we talking about four-hour capacity or two-and-a-half

hour? You know, is that a huge amount?

CHAIR STETKAR: You don't want to just focus, though, on these particular valves, because it's kind of an integrated analysis of what you might need to support the entire cool-down.

MEMBER ARMIJO: Yes.

CHAIR STETKAR: You need to operate turbine driven emergency feedwater pumps, to be able to get primary pressure down, somehow.

It's not just these valves. This is just an entree into the general topic of what happens if you need to rely only on the batteries, and how long -- you know, what is the time window? What are the plant conditions? What are the operators instructed to either do or explicitly instructed to not do?

MEMBER RAY: How do you keep the bubble on the presurizer and not the reactor?

MR. HAMAMOTO: But basically, US-APWR standard design and the condition will keep that errors out by condition after the six-hour cooling, to reach our conclusion. That is the basic shut-down operation condition.

CHAIR STETKAR: That presumes that you have ac-power available from at least one AAC gas turbine generator?

MR. HAMAMOTO: Yes, that is the basis of that design.

CHAIR STETKAR: Okay, my general -- my own personal -- and I recognize that this is semantics, but when I think of station Blackout, I think of no alternating current power.

Doesn't make any difference whether we have emergency diesel generators or alternating AAC current gas turbines or -- I think of no ac-power.

So, your eight-hour coping period for something that's called a station Blackout really does have alternating current available from at least -- for at least seven hours of those eight, the last seven hours of that eight-hour period.

Your analysis, all of your safety analyses are based on a maximum one-hour time period, where you must rely on dc-power, is that correct?

MR. HAMAMOTO: Yes.

CHAIR STETKAR: Okay, thank you.

MEMBER BLEY: I'm just curious, I haven't thought about a situation like this before, and the link to the safety analysis.

I wonder if this rises to the level of something that ought to be an ITAAC, when these procedures are written, to make sure that this is

picked up.

It's something I think a reviewer or an inspector, at that time, would have real trouble thinking about what's out there.

CHAIR STETKAR: We should probably flag it, for when we get to -- the problem is, we probably -- we, ACRS, will probably not see those procedures.

When it comes to the chapter on emergency procedures, you know, we'll -- we should raise that flag again, unless something changes in the interim, to provide, you know, longer capacity or some other information comes.

I have another question here, and I'm not sure -- no, go on. That was -- this is a question for the staff.

MR. KIPPER: All right.

CHAIR STETKAR: Thanks.

MR. KIPPER: Some of the operation of the emergency feedwater and that, during these conditions, we will get into in later slides.

For the rest of 10.3, I'll provide a brief overview of the major RAI's that we have received on the main steam supply system.

Ten.3 contains three confirmatory items and then, in 10.4, all of the RAI's have been closed

out.

Starting with the RAI's of 10.3, the staff issued an RAI to address the issues of water hammer and relief valve operation to meet the dynamic effects requirements of GDC-4, and also, to develop operating and maintenance procedures for personnel to minimize those occurrences.

The US-APWR design does consider the dynamic loads from water and steam hammer and valve closures, and other fluid forces from safety and relief valve actuations in the design of the plant, and we do have a COL item, which we have added for the COL Applicants, to develop and implement procedures to minimize and reduce the effects of dynamic loads on the main steam supply system.

The staff also issued two RAI's to address two sections from different reg guides on the -- the first was Reg Guide 1.37 on cleaning of fluid systems.

I believe this is related to construction and fabrication of the main steam system, and also, Reg Guide 1.5 on control of pre-heating for welding during construction and fabrication.

MHI has updated the tables in Chapter 1 to address these sections of the reg guides, and that has been included in the first tracking report, after DCD

Revision 3. So, it will be incorporated into the next revision of the DCD.

The third confirmatory item was to modify the DCD to address final system evaluation of code class and non-code class systems, which could be susceptible to flow-accelerated corrosion.

MHI will update the evaluation when the final design is complete and recommend any additional material upgrades for areas where flow-accelerated corrosion is -- appears to be a problem in areas that appear to be susceptible for it, in order to maintain the expected -- the minimum wall thicknesses for their design life of 40 years, for the main steam system.

MEMBER SHACK: In the DCD, they keep talking about a 10-year corrosion margin, and how in the world does that relate to the 40-year life?

MR. KIPPER: Just a second.

MR. KAWATA: This is Naoki Kawata from MHI.

This RAI response is not referred to DCD revision three, but we redirected the response to the RAI-3, DCD Revision 3, RAI tracking report.

Now, DCD does not include that --

CHAIR STETKAR: I'm sorry, could you speak up just a little bit, or move your microphone around

from the back of your laptop, so, that it picks up your voice a little bit. It helps us and it also helps the recorder.

MR. KAWATA: Okay, sorry. This one, the response, is not reflective to the DCD Revision 3, because this is a confirmatory item.

But we already redirected our response to that, the DCD Revision 3, directory. This tracking report is already --

MR. SPRENGEL: This is Ryan Sprengel. Let me clarify.

So, we had a DC Revision 3, you know, previously submitted. Everyone should have access to that, on the 12th, August 12th, we submitted a DCD tracking report, which is basically like an interim revision. It shows changes after DCD Rev 3.

So, he's just saying we haven't actually addressed this in DCD Rev 3, but the changes have been put into the tracking report.

MEMBER SHACK: For clarification, do those changes either remove statements regarding the 10-year corrosion margin, or do they more fully explain what that means?

MR. SPRENGEL: No, we've changed our position to commit to a 60-design life -- 40 year,

sorry.

MEMBER SHACK: Okay. So, 40-year? So, that means like, all those diagrams I see where you've got carbon steel here and P-22 there, that may have all changed around now, as you're aiming for a 40-year design life?

MR. KIPPER: That is true. This RAI response replaces the 10 years with 40 years, and I am not certain whether there are changes in the sections right now, but we --

MEMBER SHACK: Those tables that tell me --

MR. KIPPER: Right.

MEMBER SHACK: -- this pipe is --

MR. KIPPER: Though we will perform a final design evaluation, which may result in additional changes to those tables, at this point, but --

MEMBER SHACK: And that would be in a DC-something-or-other?

MR. KIPPER: When -- how would that --

MR. DAVIS: Excuse me, this is Bob Davis from the staff.

The RAI response addressed our issue with the 10-year. We were also having issue with the 10-

year design life, and I think that that must have been a mis-communication.

But all of that, in the RAI -- there is an amended RAI response for RAI-12, where they've deleted all the 10-year references and they've gone to a 40-year, and this is --

MEMBER SHACK: Yes, but I mean, you delete the reference, but what did they actually do?

I mean, did they put in more P-22 or did they --

MR. DAVIS: No, initially, I think it was a mis-communication, that -- I don't know where the 10-year came from, but it went away and they're going to do it.

It is 40 years and they do use chrome-moly for all the feedwater piping, and as with the other design centers -- the other designs, we have asked them to commit to doing a final system design analysis when the system is completely designed, which it hasn't been, now, that they will make upgrades are necessary, to provide reasonable assurance that they will have a 40-year design life.

So, right now, what they've committed to is consistent with all the other DCD reviews that we have done, and I have a copy of that amended RAI

response that I can show you, and you can see all the materials that they're using, where they're using chrome-moly and so far, in the feedwater line.

CHAIR STETKAR: Will that be documented clearly, in the DCD, that is in the -- in the final DCD?

MR. DAVIS: The 40-year design life?

CHAIR STETKAR: Not the commitment to the 40-year design life, but details about where specific materials are used?

MR. DAVIS: Absolutely, it should be in -- that actually should be in Rev 3, it can show you where they're using --

MEMBER SHACK: Well, I mean, there is a table, now, but you know, that would -- so, I guess the answer -- what you're telling me is the 10-year design life really didn't mean anything?

MR. DAVIS: That is what I've -- in my opinion, exactly.

MEMBER SHACK: So, the --

MR. DAVIS: I don't know where that --

MEMBER SHACK: So, the piping diagram they have is really the piping diagram that you think they're going to have, subject to this final review, but I mean, so, they've got chrome-moly where they

think they need it, and carbon steel where they don't?

MR. DAVIS: Where you would expect to see chrome-moly, they have it.

MEMBER SHACK: Well, I would have designed the system virtually, all chrome-moly, at least with dry steam, myself, but I mean, it's their system.

MR. DAVIS: Right, the feedwater is two-and-a-quarter chrome.

MEMBER SHACK: All right, yes.

MR. KIPPER: That was our last confirmatory item for 10.3.

Now, I believe I'll move onto 10.4, which is the other systems of -- other features of the steam and power conversion system.

I may move pretty quickly through some of these sub-systems. There are a lot, and that way, we can focus on where the Sub-Committee has any questions.

The first sub-section in 10.4 is on our main condensers, which is a non-safety related system.

We use three stages -- three shells of the condensers, one below each stage of the low pressure turbines, and these condensers remove the heat from the exhaust steam from the turbines, and also, provide heat sinks for the turbine bypass system, if steam is

dumped to the condensers, rather than going through the turbine.

MEMBER SHACK: Now, you say titanium there, but you actually have options for other materials, right, or would you change that?

MR. YAMAMOTO: Yes, standard material is titanium, but we can use such as stainless steel or --

MEMBER SHACK: Steel or the --

MR. KIPPER: Yes, thank you, gentlemen.

MEMBER SHACK: That hasn't changed?

MR. YAMAMOTO: Yes.

MEMBER SHACK: Okay.

MR. KIPPER: On the main condenser, the major RAI's by the staff, first, was on the potential of hydrogen build-up, and the next sub-section here discusses a condenser evacuation system, which removes non-condensibles.

That is one reason why we don't expect any significant hydrogen build-up.

Also, the main non-condensible gases removed by those will be mainly air, nitrogen and ammonia, which we use for pH control.

The next dash -- the next RAI for this section was just to include that discussion in Sub-Section 10.4.1, which has been included in DCD

Revision 3.

Sub-Section 2 is the main condenser evacuation system. It is a non-safety related system, which removes non-condensible gases during start-up and normal operation, to establish and maintain a vacuum in the main condenser.

There is one vacuum pump per condenser shell, and they can be interchanged, and they are cross-tied to each condenser shell, and they do include radiation monitors on the exhaust, which on the next slide, was the major RAI issued by the staff on this, was to define procedures and levels for monitoring and controlling any radiation, which may be exhausted by the system due to leakage from the primary to secondary systems.

These details are addressed in Chapter 11, Sub-Section 11.5, which is the radioactive waste management systems and the process in effluent radiation monitoring systems.

The second RAI on this section was then just to modify Chapter 10 to reference and refer to the content in Chapter 11, and that modification was performed in DCD Revision 3.

Sub-Section 3 is the gland seal system, also, a non-safety related system. It prevents air

leakage into and out of the casings of the steam turbine.

It's supplies sealing steam to the turbine shaft through the main steam line during normal operation or our auxiliary steam supply system, when main steam is not available, and it includes its own condenser and evacuation system to exhaust the non-condensibles from the steam air mixture from the turbine glands.

CHAIR STETKAR: Scott, I notice you only have one gland steam condenser in this design. You don't have a parallel set of two.

MR. KIPPER: Yes.

CHAIR STETKAR: Is that kind of standard design for Japanese plants, and what is the operating experience with that?

Most plants that I've seen have two parallel gland steam condensers, in case you get problems with one, so, you don't have to shut the whole plant down.

MR. YAMAMOTO: Yes, Yamamoto speaking. From our experience, it's all our PWR's in Japan have one steam gland --

CHAIR STETKAR: Just one?

MR. YAMAMOTO: -- condensers.

CHAIR STETKAR: And you haven't any availability problems?

MR. YAMAMOTO: We don't have such a problem.

CHAIR STETKAR: Okay, thank you.

MR. KIPPER: On this system, similar to the condenser evacuation system, the staff requested that we provide procedures to control releases of any radioactive materials in the exhaust.

Similarly, this procedure is described in Chapter 11, and the staff issued a follow-up RAI, to ask us to refer to that discussion in Chapter 10, which has been performed in DCD Revision 3.

Sub-Section 4 is the turbine bypass system, which is a non-safety system, also. It is considered part of the main steam system and it sends steam directly to the main condensers to bypass the main turbines.

It has a capacity to bypass 67.5 percent of the rated steam flow, and handle a 100 percent load rejection without tripping the reactor or actuating any main steam relief valve, safety valves or the presurizer safety valves.

MEMBER BLEY: Has there been any experience with that in operation in Japan? Does it

work half of the time or all of the time? Do you know?

MR. KIPPER: Have we actually had a load rejection trip at a Japanese plant, or is this an update to the control and plant design for the US-APWR?

MR. HAMAMOTO: This is Hiroshi Hamamoto. In the Japanese case, it depends on the plant by plant.

Some plant is 50 percent flow to the plant, and some plant is 100 percent load flow to the plant.

So, our experience is 10 -- the Japanese plant is -- has 100 percent load acceptance capability, but the number is -- the numbers, we need to confirm.

MEMBER BLEY: I wasn't asking the fraction. I was asking, have you ever had a load rejection under the system, actually --

CHAIR STETKAR: I mean, if you had 1,000 load rejections, does -- has it worked, you know, 999 times out of 1,000, or two times out of 1,000, or if you've only had one load rejection, did it work or didn't it work, or have you had zero load rejections?

I mean, that is kind of the question that

we're asking is, what is the actual operating experience with challenges to a full load rejection plant in Japan?

MR. HAMAMOTO: Sorry, we need to confirm.

CHAIR STETKAR: All right, okay, thanks.

MR. KIPPER: And those actual numbers and that discussion was the major RAI on the turbine bypass system from the staff, was to define the maximum step changes and capacities of the bypass system.

And so, as discussed previously, we did respond and add that the bypass system is rated for 67.5 percent of the power steam flow. You may see a value of 68 percent in the staff's presentation, that is just DCD Revision 2. This is Revision 3.

And also, in addition to handling the 100 percent electric load rejection, we also added the discussion that three of the turbine bypass valves are capable of bypassing 13.6 percent of the steam flow to maintain the operable cool-down rate of 50 degrees per F, during normal plant shut-down.

CHAIR STETKAR: Scott?

MR. KIPPER: Yes.

CHAIR STETKAR: Can I ask you, this turbine bypass system, it's got a lot of capacity. I

looked at some of the controls for it. I know that the bypass valves are basically opened in four banks, so, the four banks, you know, sequentially opened or -- I guess, all of them are opened on a full load rejection event.

I don't want to get into details, in the interest of time, in some of the control questions that I had, but there are no isolation valves for the turbine bypass valves. Is that correct, automatically operated isolation valves? There are manual isolation valves.

MR. KIPPER: Yes.

CHAIR STETKAR: My question is, what happens if a bank of turbine bypass valves opens, because they open fully and then modulate closed, and sticks open?

What happens to the plant? What protection do you have for that, and I'm not interested in hearing about separate signals that tell that same valve to close, because all of those signals are processed through the same signal process, and --

MR. KIPPER: Well, on a low steam line pressure signal, then the main steam isolation valves would close.

CHAIR STETKAR: Would you get that --

would you get that signal? When would you get that signal, if the bank of valves stuck open, and during the interim cool-down period, what happens to the rest of the plant?

I don't know how fast the signal would be generated.

MR. KIPPER: Right.

CHAIR STETKAR: I don't know when it -- you know, so, it's -- I'm interested in cool-down transients from stuck open bypass valves, basically, and not a single valve, because they're opened --

MR. KIPPER: Right.

CHAIR STETKAR: -- in a group.

MR. HAMAMOTO: This is Hiroshi Hamamoto. Sort of transient is included in main steam line break event.

The experience has been the main steam isolation valve is closed, the main steam line low pressure.

CHAIR STETKAR: See, now, I haven't looked at Chapter 15. Does that analysis specifically look at a bank of turbine bypass valves stuck open?

I'm not interested in a large main steam line break, because I understand that the MSIV's will close rather quickly for that event.

I'm interested in a bank of turbine bypass valves stuck open, something -- I don't know how the valves are -- the 15 valves are arranged in the four banks, but let's say, something on the -- the equivalent of 15 percent rated steam flow.

MR. KIPPER: Right.

CHAIR STETKAR: Fifteen to 20 percent ballpark range.

MR. KIPPER: I mean, I don't know, I don't believe we have the Chapter 15 people here.

CHAIR STETKAR: Yes.

MR. KIPPER: But you know, we -- I do know that at some point on low steam line pressure, the main steam isolation valves would close.

CHAIR STETKAR: At some point?

MR. KIPPER: Yes, but I don't know exactly when --

CHAIR STETKAR: What that point is.

MR. KIPPER: -- and I don't know exactly if a full bank of all four of the turbine bypass valves have been assumed to stick open.

You know, perhaps one or two, but all four remaining open, I'm not sure.

CHAIR STETKAR: You may want to take it as a take-away and look into it.

MR. KIPPER: Okay.

CHAIR STETKAR: Simply because they are controlled in banks, and if there is a control signal malfunction that tells an entire bank to stick open -- to stay open --

MR. KIPPER: Yes.

CHAIR STETKAR: -- for whatever reason, that is a failure mode that could cause an over-cooling transmission.

MR. KIPPER: Okay, let's see, I think then we are ready to move onto 10.4.5, which is the circulating water system.

This is the non-safety related system, which would remove heat from the condensers during various plant operating conditions.

It is our -- it is the heat removal during start-up, shut-down, normal operation transients and turbine trips.

It is a -- its design and parameters is largely a site specific design. So, no RAI's were issued on this sub-section in the DCD, and I believe Luminant will be addressing this for their design this afternoon.

CHAIR STETKAR: Let me ask you just one question.

MR. KIPPER: Yes.

CHAIR STETKAR: And we will discuss the Luminant, in the context of Luminant's presentation.

But the non-essential service water system is supplied from the circulating water system, between the circulating water pumps and the condenser inlet valves for one of the sections of the main condenser.

And I know from Luminant's presentation, that they didn't make any changes to that part of the design. So, the certified design has that.

The non-essential service water system, if I look in Chapter 9 of the DCD, provides cooling -- it's only cooling load is the turbine component cooling water system, TCS.

MR. KIPPER: Yes.

CHAIR STETKAR: That systems cools the main condensate pumps, the main feedwater pumps, essentially, everything in the turbine building.

So, if I have a loss of all circulating water flow, I will have a loss of all condensate and feedwater flow and a loss of any other systems in the turbine building, is that correct?

MR. KIPPER: At some point, yes, and on tripping on all of the feedwater pumps, our emergency feedwater system would actuate.

CHAIR STETKAR: I understand, but essentially, this design makes the main condensate and feedwater system directly reliant on the circulating water system, which is a little bit different from other system -- other plant designs.

MR. KIPPER: Are there --

MR. HAMAMOTO: I can just -- this is Hiroshi Hamamoto.

I can catch up to your question. What is the -- please, the question again?

CHAIR STETKAR: Well, my -- it's not really a question. I just want to confirm my understanding, that in deed, in this particular design, which because of the configuration of the non-essential service water supply line, that if you lose all of your circulating water pumps, if you have no force flow from the circulating water system, will you lose -- I'll phrase it in a question.

Will you lose cooling for the condensate and feedwater system, such that you will then have a loss of all condensate and feedwater flow, or is there some feature of the design that if you do not have forced flow from some number of circulating water pumps, that the non-essential service water pumps will still retain suction?

MR. KIPPER: Let me summarize.

CHAIR STETKAR: Okay.

MR. KIPPER: Are there any alternate sources for turbine cooling system, or the non-essential service water system, besides the circulating water?

MR. HAMAMOTO: We don't have them, no.

MR. KIPPER: No?

MR. HAMAMOTO: No.

CHAIR STETKAR: Can you supply -- if I fail all of the circulating water pumps, for whatever reason, will the non-essential service water pumps then lose suction?

MR. YAMAMOTO: Yamamoto speaking. Basically, all the circulating pump is not available. At the time, pump will be tripped, because of the high back pressure of the condenser.

In such case, preferably, the ac power is no more available, not only for the separating water pump, but also, every pumps.

Then in that case, not so much cooling water is required for the pumps, but the cooling waters for steam turbine is required, during the cool-down.

Other times, non-service -- non-necessary

service water is not available, but the TCS pump is available, through the gas turbine power, just circulating, but no heat rejections.

CHAIR STETKAR: Does it come from the emergency gas turbine power?

MR. YAMAMOTO: Right.

CHAIR STETKAR: Oh, it does, the TCS pumps?

MR. YAMAMOTO: One or two or three pumps are connected to the gas turbine. Then at other times --

MR. HAMAMOTO: This is Hiroshi Hamamoto. This was a little bit confused.

Basically, saturation water is lost, turbine torrent. We cannot provide ac power from that. You need it, there.

But we can receive the off-site power for the --

MR. YAMAMOTO: Yes, that is correct.

MR. HAMAMOTO: If we use -- can use off-site power. Not to be confused, what is the discussion on the --

MR. YAMAMOTO: Yes, but I am talking about all the separating pump is not available. In that case, probably the off-site power is also not

available.

CHAIR STETKAR: We're getting into a little bit of a time problem here. We're not too tight on time, for the whole day, and I don't mind running over a little bit, but we do have -- my concern is, we have the emergency feedwater system to cover in your presentation, which I suspect, we'll have a lot more questions on.

MR. KIPPER: Okay.

CHAIR STETKAR: So, I think in the interest of time, I will keep my mouth shut about this particular issue.

I just wanted to make sure that I understood the design, and I don't want to get into specific scenarios about what might be lost.

But if it's true that some of the turbine cooling system, component cooling system pumps can be powered from the gas turbine generator, that helps a little bit.

MR. KIPPER: Right.

CHAIR STETKAR: So, thanks.

MR. KIPPER: All right, okay, moving on, Sub-Section 6 is the condensate polishing system, which is, just maintain secondary side chemistry to remove any dissolve solids or corrosion products.

We had a few RAI's on water chemistry on the secondary side, and we do follow -- we did resolve the water chemistry RAI's in this last RAI-630 shown here, and the US-APWR does follow the EPRI-PWR secondary water chemistry guidelines, and we made a number of changes in the water chemistry sections in 10.3 and then, in 10.4 for the condensate polishing system, to address the staff's concerns and follow the EPRI guidelines.

MEMBER SHACK: And that would be explicitly called out in the DCD, that you're following the EPRI guidelines?

MR. KIPPER: Right now, I believe it is called out as the --

MEMBER SHACK: The COLA?

MR. KIPPER: The latest version upon COLA Applicant submittal. So, yes, it is called out for the EPRI guidelines.

CHAIR STETKAR: As an example of the fact that although my brain cells are deteriorating with age, my ability to write down questions and track them is not.

In our discussion of Chapter 5, Dr. Bley raised a question regarding operating experience in Japan, with the steam generators.

It was noted that the steam generator operating experience under the secondary chemistry programs in Japan has been very, very exemplary.

There were a lot of discussions about how good the steam generators have performed in Japan.

A question was raised, if the EPRI steam generator -- if the EPRI secondary water chemistry program is different from the steam generator water chemistry program that is typically followed in Japan for these types of steam generators, are there differences in the EPRI secondary water chemistry program that could make the Japanese operating experience worse?

In other words, is the commitment to conform to the EPRI secondary water chemistry program perhaps, indicative of something because of the nature of your steam generator materials, or your operating experience, is that not necessarily a good thing to do?

MR. KIPPER: Right.

CHAIR STETKAR: And I don't know if you have any -- when we asked the question in Chapter 5, we were told, "Well, we'll discuss that in Chapter 10." We're here. We haven't forgotten.

MR. KIPPER: Okay.

CHAIR STETKAR: You're welcome.

MEMBER BLEY: I think I phrased it different. If that works so well, why in the world are you changing it?

CHAIR STETKAR: Well, that is --

MEMBER BLEY: Is this just a big experiment?

MR. KIPPER: Okay.

MR. ISHIHARA: My name is Nobuo Ishihara. I'm chemical engineer and experienced -- I honestly, the question -- there are so many differences between EPRI guidelines and Japanese experience.

But the change is not so -- there is no big difference. It's not effect to testing management.

If you use EPRI guidelines in Japanese domestic PWR's, it doesn't affect the ability of SER's.

MEMBER BLEY: I wonder how we know that, or it would be nice to see them laid side-by-side, so, we could see what the difference is.

MR. KIPPER: Do we have back-up slides for water chemistry? They are proprietary information, but I am not certain if we brought those for this afternoon.

Do we have a comparison of Japanese water chemistry guidelines with the EPRI guidelines?

MR. ISHIHARA: Yes.

MR. KIPPER: Okay, and in the back-up material that we brought today?

MR. ISHIHARA: Okay.

CHAIR STETKAR: If you have that available, if it's proprietary --

MR. KIPPER: Yes.

CHAIR STETKAR: -- it may be, if it's proprietary, why don't I propose, let's -- I'm starting to get a bit concerned about time management here.

MR. KIPPER: Okay.

CHAIR STETKAR: If you have that material available, it may be most productive to discuss that material after lunch, if you can -- if you want to do that.

Let us know if you have it, and we'll try to decide where the most opportune time is to go into closed session, if the material, in deed, is proprietary.

MR. KIPPER: Right.

CHAIR STETKAR: But it would be worthwhile, if you do have a comparison between the

two sets of guidelines, to show us what the differences are, so that we have assurance --

MR. KIPPER: I'll see exactly what we --

CHAIR STETKAR: -- that they're not significant.

MR. KIPPER: -- what we brought, otherwise, this may be a take-away.

CHAIR STETKAR: Otherwise, it may be a take-away, okay, thanks.

MR. KIPPER: Okay, moving onto Sub-Section 7, this is the condensate and feedwater system, which provides feedwater from the condensers through the re-heaters to the steam generators.

This does perform a safety function of containment vessel and feedwater isolation following main steam line breaks and feedwater line breaks, and to limit any mass and energy releases into containment.

Again, the safety related portions of this system and these isolation valves would be in the reactor building and not in the turbine building.

For this sub-section, the major RAI was to address any procedures for water hammer issues and GDC-4.

Similar to other sections, this is a COL

item for the Applicants to develop operating and maintenance procedures to minimize the effects and reduce the frequency of water hammer events.

Sub-Section 8 is the steam generator blow-down system, which monitors and controls secondary side water chemistry, due to any off-normal chemistry conditions, such as condenser tube leaks or steam generator tube ruptures.

It includes safety related functions to provide containment isolation and secondary side isolation to isolate the steam generators, and there is -- all of this -- these components, these safety related components would be in the reactor building and not the turbine building.

Similar to the condensate polishing system, a number of the RAI's were to address secondary side water chemistry control.

The first was to address the US-APWR of a peripheral blow-down system within the steam generators, which is a groove of about six to seven inches below the top of the tube sheet, in the steam generators, from which the outlets to the blow-down nozzles are tapped.

Another RAI was to identify the sampling differences between the DCD and EPRI chemistry

guidelines, and back in the condensate clean-up system, we had addressed those issues by committing to the EPRI chemistry guidelines, as we mentioned. That RAI did not result in any impact on the DCD.

Question number five in the sub-section was to clarify how the blow-down de-mineralizer's interface with the condensate polishing system for condenser tube leaks.

MHI clarified in the DCD that the condensate water quality in the case of a condenser tube leak is maintained by the condensate polishing system, but the steam generator blow-down de-mineralizer can support purification by the condensate polishing system.

The last major RAI, question seven in this, was to address flow accelerated corrosion in these areas, and MHI responded that the system is designed to preclude FAC in most locations using low-alloy and stainless steels.

They do use carbon steel in areas where flow accelerated corrosion has not been evaluated to be an issue.

MEMBER POWERS: Let me ask you a question about that.

MR. KIPPER: Yes.

MEMBER POWERS: We find the flows of accelerated corrosion, the evaluations are totally experientially developed.

MR. KIPPER: All right.

MEMBER POWERS: And we find them, we put them into, what is this magic code that they use?

MR. KIPPER: CHECWORKS.

MEMBER POWERS: CHECWORKS, and then you know to evaluate them. There is no a priori prediction of FAC. It is all experientially based.

So, when you say it's been evaluated to not be an area of -- they simply just wait a while. It may be.

MR. KIPPER: It is just evaluated per guidance for what areas are considered susceptible, but the -- that is also why the Applicants include a monitoring program over the lifetime of the plant.

MEMBER POWERS: The trouble with the monitoring program is you monitor where it's been found. You don't monitor the areas that have not been found to be susceptible.

That's why we have accidents at Surry and places like that.

MR. KIPPER: Are there any other inspection or maintenance programs that would identify

any FAC in areas that were not considered to be susceptible and not included in the flow monitoring program?

MR. SPRENGEL: Okay, this is Ryan Sprengel.

Is the question whether or not the susceptible areas are re-evaluated over the life of the plant?

MEMBER POWERS: The inventory of susceptible areas that you have is based on finding flow accelerated corrosion at some plant, and it can, in fact, be a coal-fired plant.

The question is, what do you do about the areas that are not considered susceptible, but may become susceptible, based on the operating of your plant?

I mean, if it's totally based on experience, somebody just hasn't had that particular set of flow conditions and corrosion conditions, that you have, that you think is unsusceptible, and so, you're about to become, in a few years, part of the inventory of CHECWORKS. What do you do about that?

MR. SPRENGEL: I'm still not exactly sure what that question is for us.

MEMBER POWERS: At one time or another,

every entry in CHECWORKS was an area that somebody thought was not susceptible with flow accelerated corrosion.

They stood in front of some review committee and said, "We don't think that this particular elbow, this particular flange, this particular down-stream point has flow accelerate corrosion because it's not in CHECWORKS inventory," and it suddenly became in that inventory, because they got flow accelerated corrosion there.

Every place that you have, up here, that you said, "We're going to use flow corrosion," carbon steel is an area that's not in the CHECWORKS, but could well be so, because of some peculiarity about the flow conditions there. What do you do about that?

MR. KIPPER: I understand what you are asking, but I don't think we necessarily have a certain answer for it.

That would be -- that would be an industry problem and continuing to monitor operation and also, our other in-service inspections and flow accelerated corrosion monitoring --

MEMBER POWERS: The problem with the monitoring program is it's set up to monitor those locations that the CHECWORKS tells you are

susceptible.

MR. KIPPER: Right, I mean --

MEMBER POWERS: Nobody looks at the parts that aren't considered susceptible, and those are the parts that get added -- that's why they update CHECWORKS, regularly.

MR. KIPPER: Yes.

MR. SPRENGEL: So, is the question, over the life of the plant, do we have a separate monitoring program --

MEMBER POWERS: As I see it, there are two things --

MR. SPRENGEL: -- to monitor areas that are not identified susceptible?

MEMBER POWERS: There are two approaches, maybe three approaches that you could take on this.

One is you could say, "Okay, I'm going to monitor all the locations. I'm just going to do it less frequently, in those areas that I don't think are susceptible," and we could argue about what less frequency is.

The other one is say, "No, I'm going to look at this work that's going on to predict FAC in an a priori fashion," and assure myself that there is some technical reason, other than just no experience

that this particular location is not susceptible, and look at that.

And the third one -- approach would be, "I'm going to go ahead and assume that maybe there will be a flow accelerated corrosion and I'll have some defense in depth against a failure there."

Those are the only three possibilities that come to my mind, on how you might address them, but I sure don't want to get -- end up on CHECWORKS' inventory of experiences, and that's all CHECWORKS really is.

It's a little bit of chemical theory and a whole lot of experience, and there is -- I know of one group, I happened to be in Taiwan, that was trying to do some sort of an a priori prediction of flow accelerated corrosion. I don't know how that has progressed.

MEMBER SHACK: Certainly, you can do it on a conservative enough basis, if you get the flow --

MEMBER POWERS: Yes, you just assume everything --

MEMBER SHACK: -- and temperatures -- but you know, until you know exactly how they made those decisions, it's hard to know whether it's conservative enough --

MEMBER POWERS: I mean, the --

MEMBER SHACK: I assume that's part of the overall final evaluation of design, that they will be doing and --

MEMBER POWERS: I bet you this one gets overlooked like crazy, because everybody says flow of -- oh, I've got CHECWORKS, and it's not as important here, and everything in CHECWORKS was at one time, not considered important.

The usual problem is a distance downstream from a flow obstruction, is that you say, "Oh, I'm far enough downstream. I have enough pipe diameters downstream. There is no problem down here," and of course, that's exactly where the next problem shows up, and the next update to CHECWORKS takes place.

MR. KIPPER: I mean, yes, I do know that there are criteria and guidelines. There are also specific geometry set-ups and let's say, indicators of potential areas of FAC, and I cannot tell you right now, what will be in our final evaluation of flow accelerated corrosion areas at this point.

So, I can only tell you that we will be performing an evaluation according to the best guidance and industry experience out there, at this time.

CHAIR STETKAR: Is that requirement left up to the COL holder, or is that something that MHI will do as part of the Certify Design?

MR. KIPPER: That -- the monitoring is COL Applicant --

CHAIR STETKAR: That's clear.

MR. KIPPER: -- but the final evaluation of the detailed design is the -- it will be an MHI standard item, correct?

MR. ISHIHARA: Standard design for DCD.

MR. KIPPER: The final evaluation of the system design for flow accelerated corrosion, will that an MHI or an Applicant? That is Applicant also, for their --

PARTICIPANT: We get a COL stage.

CHAIR STETKAR: Well, the question -- if they're pushing it off, then the Applicant can push it off to ITAAC, and we never see it. That is the reason for my question about -- I mean, that is the way it happens.

So, your response is, this is an -- the final evaluation of the design flow accelerated corrosion, not only the monitoring program, but the evaluation of the design for susceptibility is a COL responsibility? Is that true?

MR. SPRENGEL: This is Ryan Sprengel. At this time, we don't have a clear answer to that.

CHAIR STETKAR: Okay.

MR. SPRENGEL: So, that is something that we'll get back to you on.

CHAIR STETKAR: Take that as a take-away, because --

MR. SPRENGEL: Right, at this point, there is a commitment to that final analysis that will be done.

CHAIR STETKAR: Yes, the question is by whom and when?

MR. SPRENGEL: Yes, I understand.

CHAIR STETKAR: And in our perspective, you're aware of the fact that we get involved -- in the design certification, we get involved in the COL issuance.

After the COL is issued, we're out of the loop. So, if it's something that eventually gets pushed into an ITAAC, we don't ever see that.

So, I am curious about when it will be done and whether we will have an opportunity to visit that topic, okay.

Scott, in the interest of time, let me just add, you have emergency feedwater to go through.

MR. KIPPER: Yes.

CHAIR STETKAR: I suspect there will be some discussion of emergency feedwater.

Do you think we can get through it in 15 minutes?

MR. KIPPER: How many questions will you have?

CHAIR STETKAR: Let's see if we can get through it.

MR. KIPPER: All right.

CHAIR STETKAR: And see what comes up, in the sense -- the only reason is, the staff is up after this and I don't --

PARTICIPANT: Feels like yesterday.

CHAIR STETKAR: And I don't want to -- okay, I get the message. Let's stop the discussion now, come back and discuss emergency feedwater.

We will recess for a break and reconvene at 10:45 a.m. I'll give you 15 minutes. We'll go later today.

(Whereupon, the above-entitled matter went off the record at 10:30 a.m. and resumed at 10:45 a.m.)

CHAIR STETKAR: Okay, we're back in session and we'll talk about the emergency feedwater

system.

MR. KIPPER: Okay, again, this is Scott Kipper of MNES, and Section 10.4.9 discusses our emergency feedwater system, which is our safe shut-down system on the secondary side to remove the reactor core decay and sensible heat during accident conditions.

The EFW system consists of four pumps, two of -- four 50 percent capacity pumps, two of which are motor-driven pumps are two are turbine driven pumps, which are fed from the main steam line.

They actuate automatically on an EFW actuation signal, which is created from either emergency core cooling system actuation, a loss of off-site power, tripping of all four of the feedwater pumps, or a low steam generator water level.

They also function to isolate emergency feedwater flow to a steam generator, if based on high steam generator water level or low steam line pressure from that steam generator, to isolate a defective steam generator during accident conditions.

I will go through the major RAI's and then I assume that the members may have some additional questions on the emergency feedwater system.

The first major RAI that the staff issued

was -- to discuss, was question 14, which was to discuss procedures to address steam binding issues in the EFW pumps.

This could potentially occur if there is bypass, if there is main feedwater leakage back through the emergency feedwater check valves, and MHI provided a restoration procedure to recover any restore the pumps, if steam binding did occur.

CHAIR STETKAR: Scott, is the figure -- is the EFW figure in DCD Revision 3 correct, or is the EFW figure in DCD Revision 2 correct, with respect to the location of the first check valve from the steam generator?

In Revision 2, it's shown between the isolation valve and the control valve. In Revision 3, it's shown on the pump side of the control valve, as it's shown on your drawing, there. Is that the correct configuration?

MR. KIPPER: Yes, well, Kawata-san, can you address that?

MR. KAWATA: This figure shows --

CHAIR STETKAR: This is a correct configuration?

MR. KAWATA: Yes.

CHAIR STETKAR: Okay.

MR. KIPPER: All right.

MR. KAWATA: Correct configuration.

CHAIR STETKAR: Thank you.

MR. KIPPER: So, on the pump discharge, prior to be controlled in isolation valves. Thank you, Kawata-san.

Moving on back to the RAI's, the staff also asked about procedures --

CHAIR STETKAR: Before you get into water hammer.

MR. KIPPER: Okay.

CHAIR STETKAR: One more question on steam binding.

MR. KIPPER: Yes.

CHAIR STETKAR: The procedure that you provided presumes that the steam -- any vapor will be between the two check valves.

How do you know that is true, that the steam doesn't -- any kind of non-condensible's or steam may not have collected at some other high point in the system?

In other words, it presumes that the second check valve is absolutely leak-tight.

MR. KIPPER: That would be our typical single failure there, and we do include --

CHAIR STETKAR: So, every check valve is always perfectly leak-tight?

MR. KIPPER: But we do include -- we do include temperature instrumentation to monitor and --

CHAIR STETKAR: Between the two check valves?

MR. KIPPER: Where is that monitoring instrumentation?

MR. HAMAMOTO: This is Hiroshi Hamamoto. Temperature is done -- upstream of the -- this first two check valves.

CHAIR STETKAR: It's between the two check valves. I'm looking at the drawing. I can see where the temperature instrument is. I just wanted to make sure I had the right drawing.

The response procedure says, "When the operators see high temperatures on that temperature instrument, they will isolate that piece of piping. They will fix the upstream leaking check valve," which we know is leaking, because that's the only way you can get high temperature there.

They will then refill that piece of piping and everything will be fine. How do you know that the second check valve didn't leak, also, or perhaps, wasn't seated fully, and that steam or non-

condensible's hasn't collected in some other high point in the system, when you do this procedure that the staff has accepted in their RAI as adequate for ensuring that you shall not have any problems?

MEMBER BLEY: Let me add just a little bit, or a little rephrasing.

Where in the design does it specify that these are zero leakage check valves? That is an unusual requirement and pretty hard to --

CHAIR STETKAR: Well, I mean, they presume that you could get leakage through the first one, because they have that temperature instrument there.

But my question is --

MEMBER BLEY: Why not the other one?

CHAIR STETKAR: -- how do you know the secondary --

MEMBER BLEY: The failure, you're thinking more -- it's a more gross failure, I would think, but I don't even --

CHAIR STETKAR: Yes, the second one --

MEMBER BLEY: -- expect these valves are designed to be zero leakage.

CHAIR STETKAR: The question is, how do you know that that first upstream -- the check valves that's closest to the pump discharge, that looks like

a pump discharge check valve, how do you know that that didn't also leak, and that you've had a collection of non-condensible's or steam someplace else, for example, in the pump or some other high point of the piping, that --

MEMBER BLEY: Right.

CHAIR STETKAR: Your procedure doesn't really address the notion that that could have occurred.

MR. KIPPER: Right, I am -- I mean, right now, I do not think we have the detailed design completed, to identify whether there would be any local high points that it could accumulate in.

I know that we do consider GL-2008-01, which is gas accumulation in primary systems, and -- in the design of the primary systems.

But at this point, I do not believe we have any -- we have enough information to identify that that's a credible scenario in the final detail design, at this point.

CHAIR STETKAR: That RAI is closed, though, right? So, the staff accepted your procedure as --

MR. KIPPER: Yes.

CHAIR STETKAR: -- as adequate protection

against steam binding.

MR. KIPPER: Yes.

CHAIR STETKAR: So, okay, we'll ask the staff about why that is good enough.

MR. KIPPER: Okay, yes.

CHAIR STETKAR: Okay, thanks.

MR. KIPPER: Okay, moving onto RAI question four, for this was on water hammer and maintaining the lines water-solid.

This is related to the water refilling in case leakage through the check valves is detected, and this also did include adding a COL item to -- for the Applicants to address -- to address operating and maintenance procedures for potential water hammer, similar to the other susceptible systems in Chapter 10.

And this is where we did add that procedure with the water filling requirement, prior to returning the EFW train with the failed check valve to service, and as Member Stetkar did point out, the staff has closed out and accepted the procedure that we added to the DCD.

RAI question number seven was to discuss emergency procedures for switch-over from the emergency feed water pits to the demin water storage

tank.

MHI did add a description of the switch-over procedures and a COL item for the Applicants to develop and implement those operating procedures.

CHAIR STETKAR: Two questions. What are the power supplies for the demin water storage pumps, transfer pumps?

MR. KIPPER: Demin water storage transfer pumps?

(Off the record comments)

CHAIR STETKAR: Pump power source, what is the power supply for the demin water transfer pumps?

MR. KAWATA: This is Naoki Kawata. Pump power source is non-safety related, but by using gravity, we can separate it, feedwater from demin water.

CHAIR STETKAR: Okay, that was going to be the second question.

You can gravity feed from the demin water storage tank to the EFW pit?

MR. KAWATA: Yes.

CHAIR STETKAR: Will that be verified during final plant design?

MR. KIPPER: I mean, it is a beyond-design basis condition. Is there and ITAAC and the --

CHAIR STETKAR: I'm sorry, it's not clear that it's a beyond-design basis condition.

It's providing an adequate suction to the emergency feedwater pumps. So, it's not clear that this is beyond --

MR. KIPPER: Well, it is after the emergency feedwater pits have been --

CHAIR STETKAR: Okay, okay.

MR. KIPPER: Have been exhausted.

CHAIR STETKAR: Thank you, okay.

MR. KIPPER: So, yes, our emergency feedwater pits provide for eight hours at hot shut-down, six hours at hot stand-by, six hours cooling down, and then I believe the procedure is after 24 hours, we would switch over to the demin water.

CHAIR STETKAR: Let me ask you this, then.

MR. KIPPER: Yes.

CHAIR STETKAR: Because I have other questions about capacities.

Your entry, the first entry on this slide says that there was an RAI question about capacities, and that you provided a procedure that describes the switch-over to that alternate make-ups -- or to the make-up supply.

Apparently, it's a concern. So, my

question is, if it's a concern, if you provided a switch-over, so that somebody -- you provided a procedure and a commitment that there will be a procedure and somebody will go open those valves.

Suppose I open the valves and the water doesn't flow from point A to point B, because the system design does not support gravity feed?

That is the genesis of my question, that if in deed, you can't supply pumped feed, if you're relying on gravity feed, what -- how do I have any assurance that in deed, the as-built design will support that gravity feed?

In other words, the -- why do I have any confidence in the procedure?

(Off the record comments)

MR. HAMAMOTO: Sorry, this is Hiroshi Hamamoto. The demin water is repaired to ground water.

CHAIR STETKAR: Okay.

MR. HAMAMOTO: And imagine, the feedwater is based to come out. Elevation satisfies --

CHAIR STETKAR: Okay.

MR. HAMAMOTO: But that is also a requirement. Now, some demin water, the location is changed.

We requested the design requirement between that -- an elevation difference for the de-mineralized water tanks location.

CHAIR STETKAR: Okay, okay.

MR. HAMAMOTO: That is an interface for the design.

CHAIR STETKAR: Okay, thanks, that helps a lot, and the supply line from the de-mineralized water storage tank is near the bottom of the tank, you don't have any problems with loops or anything?

MR. HAMAMOTO: Yes, the standard design, current designs, we already confirmed is satisfied.

CHAIR STETKAR: Okay.

MR. HAMAMOTO: But we need to confirm as-built locations.

CHAIR STETKAR: Okay, but that would be done, as far as as-built elevations and things like that. Thank you, thank you.

MR. KIPPER: Moving on to the next RAI question 20, the staff identified that our feed -- emergency feedwater check valves were not identified with ITAAC in Tier 1 and we will -- MHI responded that they would make those revisions to Tier 1, and Tier 1 has already been revised to include those, I believe.

CHAIR STETKAR: Yes.

MR. KIPPER: Yes, so, those ITAAC are included in Tier 1.

On the next RAI question number eight, was to discuss operation of the turbine driven emergency feedwater pumps during an absence of all ac-power, and the next RAI was a follow-up and related to that.

The turbine driven pumps are capable of operating from the Class 1E batteries for at least the two hours specified in the US-APWR design, except that the room cooling for the pump rooms would -- may need to be started within one hour, and that is -- that can be provided by a single unit of the alternate ac-gas turbine generators.

The follow-up RAI asked -- pointed out specifically, how can we address and ensure that within one hour, we will have the alternate ac's online to provide pump ventilation, and isn't that contradictory to the recommendation GS-5 in the NUREG-0611 and 0635?

This goes back to the US-APWR design for station Blackout, discussed in Chapter 8, in which we have four emergency gas turbine generators and then our two additional alternate ac-gas turbine generators.

They are designed to limit common-cause

failures between the two, and therefore, the US-APWR design is such that we do provide the AAC's, so that after they are started within one hour, they can be credited for providing ac-power during station Blackout conditions.

CHAIR STETKAR: Let's go back.

MR. KIPPER: Go back?

CHAIR STETKAR: To emergency feedwater. You're not going to get away that quickly.

MR. KIPPER: Yes.

CHAIR STETKAR: I just want to make sure, so, the basic design is that the turbine driven emergency feedwater pumps on this plant will run for a maximum of one hour with no ac-power available in the plant. That is true?

MR. KIPPER: Yes, the air handling units for the rooms.

CHAIR STETKAR: Have you done any analysis --

MR. HAMAMOTO: Excuse me, turbine driven emergency feedwater pump does not request any ac-power.

CHAIR STETKAR: I understand, but if the room gets so hot that the turbine controls --

MR. HAMAMOTO: Oh, yes.

MR. KIPPER: Right, right.

CHAIR STETKAR: -- fail to operate, the pump will not operate. So, I don't particular care what the turbine will do under those conditions.

Have you done any room heat-up analyses, to actually -- you claim A) that room cooling is required after one hour, and you claim that it will run without failure for one hour, with no room cooling.

Have you done any room heat-up analyses and analyses of the vulnerability of any of the turbine control systems, to thermal failures, to confirm both of those assertions?

In other words, how do you have assurance that it will run for at least one hour?

MR. KIPPER: Well, the one hour is our design basis for the AAC's, but I do not believe we have done a -- you know, a realistic analysis, to show that it is an actual limitation.

CHAIR STETKAR: Have you done an analysis to confirm that in deed, it will run for one hour before any thermal failures of the controls for the turbine driven --

MR. KIPPER: For those ones, yes.

CHAIR STETKAR: Okay.

MR. KIPPER: Yes, but beyond that, we --

CHAIR STETKAR: You don't know?

MR. KIPPER: Yes, we credit our design basis for the AAC's.

CHAIR STETKAR: Okay, thanks.

MR. KIPPER: The remaining two sections may be kind of short. Does the staff have any -- or does the Committee --

CHAIR STETKAR: I've got one more. You're not going to get away this quickly.

MR. KIPPER: Yes, I gave you time.

CHAIR STETKAR: Turbine -- okay, well, I've got a lot of notes, here. It takes a while to sort through them and get neurons to fire.

Have you looked at potential missiles generated from your emergency feedwater turbines and what damage those missiles can cause?

MR. KIPPER: Let's see --

CHAIR STETKAR: And I'll ask you to go back to the drawing of the system, so, that we can see the configurations of those.

MR. KIPPER: Go back to slide 38. In general, missile analysis is handled in Chapter 3.

Have we specifically addressed or evaluated the turbine driven pumps with regard to the

-- let me say that the other safety related components around the turbine driven pumps would be protected from damage from line breaks and missiles and dynamic effects, such as that.

CHAIR STETKAR: If I -- I understand that. If I look at the configuration of the system and understand where the piping is located, my specific concern, if you wanted me to telegraph things.

If this is a Chapter 3 issue, have you looked at turbine driven pump generated missiles that could break the suction line piping in that room, because if you do that, you won't meet your design criteria.

You're going to drain one your emergency feedwater tanks and you won't have enough inventory, and you can't make up to the pair of pumps.

I don't want to waste time going through why that is. It just is, and I'm not going to send an operator in there to close the valve.

MR. KIPPER: Right.

MR. HAMAMOTO: Basically, as you say, the Chapter 3, it would -- so, that we need to confirm --

CHAIR STETKAR: I'll save the question for Chapter 3, then.

MEMBER REMPE: Just out of curiosity then

--

CHAIR STETKAR: Make sure you're prepared to answer that question, in terms of your general missile analysis.

MEMBER REMPE: On your question about the analysis, that the EFWS would last for an hour, is that something that's actually submitted to the staff and the staff reviews it?

You said, "Yes, we've done analysis." It is reviewed analysis or --

MR. KIPPER: We have not -- I do not believe we have submitted or -- or the staff has audited that reviewed analysis.

MEMBER REMPE: Is that part of the plan? I mean, if it's part of meeting the criteria, does the staff intend --

CHAIR STETKAR: Let's ask the staff, when they come up.

MR. KIPPER: Okay.

CHAIR STETKAR: Do you have any notion, what is the -- the design -- I understand the -- I've lost my notes, here, which is why I'm struggling.

The total amount of inventory required to satisfy the nominal eight hours of hot shut-down, six hours to cool-down to RHR, can one pump with normal

inventory from one tank maintain you at hot shut-down for 24 hours?

MR. KIPPER: We -- one pump from one tank, we have not evaluated or analyzed at this time.

CHAIR STETKAR: Two pumps from one tank?

MR. KIPPER: Two pumps from one tank?

MR. HAMAMOTO: Yes, this is Hiroshi Hamamoto.

We're talking -- from the capacity of -- in the feedwater tank, total capacity has a 24 hours hot to -- keep the whole standby condition.

CHAIR STETKAR: It does, at minimum level?

MR. HAMAMOTO: Yes, at the minimal level.

CHAIR STETKAR: Okay.

MR. HAMAMOTO: Even the specification describes that. That is our -- the minimal level water capacity, can keep it at 24 hours.

CHAIR STETKAR: The minimum level is, as I understand it, designed for eight hours at hot standby with a six hour cool-down.

MR. HAMAMOTO: Six hour, and that capacity, that is the one capacity requirement and the other is 24 hours hot standby, by condition to keep.

CHAIR STETKAR: Okay.

MR. HAMAMOTO: And those amounts of

feedwater, the capacity has 24 hours duration, hot standby conditions.

CHAIR STETKAR: Is that -- when you say both, you mean, if I have -- if I am in a configuration, for example, where I only have one emergency feedwater pit available, the other one is not available, for some reason.

Is the capacity of that one pit sufficient to maintain hot standby for 24 hours, or do you require both pits?

MR. HAMAMOTO: Both.

CHAIR STETKAR: Both pits?

MR. HAMAMOTO: Yes.

CHAIR STETKAR: Okay, but you can maintain hot standby for 24 hours with that -- without additional make-up?

MR. HAMAMOTO: Yes.

CHAIR STETKAR: If you have the two pits?

MR. HAMAMOTO: Yes.

CHAIR STETKAR: Okay, thanks. That helps.

PARTICIPANT: Now, you can talk about aux steam.

CHAIR STETKAR: Oh, okay.

MR. KIPPER: Actually, I think we skipped one, if you can back up to 10.4.10.

CHAIR STETKAR: I'm sorry.

MR. KIPPER: This is just the secondary side chemical injection system, which is where the condensate polishing system does filtration and dissolves solids and corrosion products.

The secondary side chemical injection does pH and oxygen control, to maintain chemical conditions, and we use morpholine and DMA for maintaining pH during operation and ammonia for pH control during lay-up conditions, and then we use hydrazine for an oxygen scavenger.

The staff did not issue any RAI's on this sub-section. So, I think we can move along to the last section in 10.4.11.

The auxiliary steam supply system is also a non-safety system. It's used during start-up, shut-down and parts of normal operation, when main steam is not available and it supplies steam to the secondary side and primary side components, as necessary, whenever main steam is not available from an auxiliary boiler located out in the yard, and again, the staff had no RAI's on this sub-section of the DCD.

So, that is the end of MHI's presentation on Chapter 10.

There were three open items discussed in

this presentation. There are five open items total. Two of them, MHI believes are just editorial or clarification non-technical open items, and the staff may address those.

And there are four remaining confirmatory items that were discussed in the presentation and will be incorporated into the next DCD revision.

So, unless the Subcommittee has any additional questions or comments, I would like to thank you for your time and the opportunity to present to you today.

CHAIR STETKAR: Any members have any additional questions, comments, anything?

Good, thank you very much. It was good presentation, learned a lot, and I guess we're ready for the staff on Chapter 10, if the staff is ready. I didn't see Jeff, if he is -- okay, good.

I do -- we do need to break, Hossein, at noon, because I know at least one member has another commitment, and so, if the staff can sort of, you know, organize your time to get to a convenient stopping point, if you're not finished by noon.

MR. HAMZEHEE: Yes.

CHAIR STETKAR: We do need to do that.

MR. HAMZEHEE: All right.

(Off the record comments)

MR. HAMZEHEE: Whenever, John, you are ready.

CHAIR STETKAR: I am ready whenever you are. It's your show.

MR. KALLAN: All right, thank you.

CHAIR STETKAR: Paul.

MR. KALLAN: Thank you. My name is Paul Kallan. I'm the steam project manager and also, I'm the chapter PM for Chapter 10.

We're here to present to you, the SER with open items for Chapter 10.

CHAIR STETKAR: Well, just make sure you speak up or move your microphone around.

MR. KALLAN: Okay, thank you.

CHAIR STETKAR: Because as I said, it helps us and also --

MR. KALLAN: Sure.

CHAIR STETKAR: -- the transcript.

MR. KALLAN: On slide two is the staff review team. To my right is Devender Reddy. He is -- basically, was -- had open items on 10.2, and John Honcharik for 10.2.3.

Jeff Ciocco is the lead project manager and as I mentioned, I was the -- I am the chapter PM.

Going to slide three is the overall team that actually worked on this SER.

On the next slide, slide four is the overview of the design certification, and it's on this slide, it basically shows the section application and the number of questions and the open items.

In 10.2, there was one open item. In 10.2.3, there were four open items, and I'm not going to go through each section, but you could -- just an idea of how many questions were asked and what the open items were.

Section -- I mean, slide five is the same thing. In slide six, overall, we had a total of 95 questions that we asked, and there were five open items, and with that, I'll turn it over to Devender Reddy, for Section 10.2, turbine generator.

MR. REDDY: Mr. Chairman, Members of the Committee, and the Applicant MHI, and the public, also, the staff, good morning. My name Devender Reddy, as Paul said.

I am the Balance of Plant Branch Technical System Reviewer, and with me is John Honcharik. He is in the Components and Division Branch of the Division of Engineering.

John and I, we are here to present the

staff's evaluation of Chapter 10 of the APWR design certification.

I'd like to provide you a brief background of what we have done in this evaluation.

On the systems side, of course, on both sides, the staff's review of the DCD is based on Revision 2 of the application.

Also, the staff's review is based on NRC regulations and the guidance, which explains our proprietary guidance, how to read the regulations.

Additionally, the staff focused on its review on the comments that were received from your Committee and from the other applications in the past.

Furthermore, the staff considered operating experience in sites. It was to review potentially, the turbine generator system.

Now, regarding the staff evaluation, in the process of our review, the staff found quite a few deficiencies in the application starting from Rev 0 to Rev 2 of the DCD.

As a result of these deficiencies, we received series of RAI's. Also, the staff had face-to-face meeting and telecons in this regard, to resolve the RAI's.

Regarding Applicant responses, because of

the RAI's, telecons and face-to-face meetings, the Applicant provided proper formal responses, until recently, they have been providing us.

Based on the review of the Revision 2 of the DCD, and Applicant's responses, the staff found the APWR design acceptable, since it met the reg guides, such as GDC's and NRC guidance, except for one thing.

There is one open item for the -- on the systems side of it. That open item is, in the process of MHI providing responses to staff, staff's -- systems RAI's, MHI provided Tier 1 ITAAC and a key design features in Table 2, 2.7.1.1-1 and Section 2.7.1.1 of the DCD.

In the process of -- as the responses to RAI's, particularly for Section 10.2-4, I'm sorry, that is RAI 10.2-4, and 10 -- 14.3.7, that is the ITAAC questions 51 to 52, MHI deleted some stuff, regarding the turbine orientation and the missile probability from that ITAAC table.

Also, MHI deleted key design features from the Tier 1 section, which affected the staff evaluation of 3.5.1.3, which John has the responsibility.

Therefore, if cooperation of John, I

deleted the RAI from the open item, the RAI 5910, Question 14.3.7. The staff requested to include the TG orientation and the turbine missile probability, which was there before Rev 2, so, that you know -- we do not create another open item for Section 3.5.1.3.

Now, what happened, we issued the RAI and that is why I think they responded, I didn't see that, and we are going to evaluate that and close this open item.

There is one more thing -- a few things I'd like to point out.

In our review, however, you may not have -- we have mark-up FSAR, and we base our evaluation on this mark-up. This is not in Rev 3. To a great extent, it's not there.

CHAIR STETKAR: Yes, I found a couple of places that referred in your SER, to sections in the FSAR that don't exist. So, that explains where they are.

MR. REDDY: Yes, but -- yes, go ahead.

CHAIR STETKAR: No, that's fine.

MR. REDDY: Yes, and --

CHAIR STETKAR: I understand the evolving nature of these things.

MR. REDDY: So, in addition to that, Mr.

Brown, you know, you were looking for a diagram, actually. I gave you -- I gave it to somebody to give you, the RAI responses, which has -- I think it is public. What do you call this? A fluid control diagram.

MEMBER BROWN: The fluid control diagram is in there.

MR. REDDY: Yes.

MEMBER BROWN: It's figure 10.2.3, or something like that.

MR. REDDY: Yes.

MEMBER BROWN: Dash-3.

MR. REDDY: Right.

MEMBER BROWN: But what is not in there is a schematic, simplified schematic of the normal DE digital electro-hydraulic control -- for the electrical part, for the control system, electronics part of it, and the over-speed protection circuit associated with the normal control circuits.

There is a figure in your other RAI, relative to the independent --

MR. REDDY: Right.

MEMBER BROWN: -- electrical trip circuit.

MR. REDDY: Yes.

MEMBER BROWN: So, what I'm looking for

is, what does that look like and how is that going to be incorporated into the DCD, relative to the normal control circuit, and I have gone through the SER. I went through the DCD Rev 3 --

MR. REDDY: Yes.

MEMBER BROWN: -- of Chapter 10, and I couldn't find it in there. I looked in Chapter 7 of Rev 3, and I couldn't find anything in there.

So, that is kind of the open question with me. I don't have any problem with the mechanical one and the figure 10.2-3, which, that shows the separation of the mechanical from the other electro-hydraulic -- or the other hydraulic part of the control system, and that looked okay.

MR. REDDY: Correct.

MEMBER BROWN: But the normal control schematic is not anywhere. So, or at least, I couldn't find it.

CHAIR STETKAR: Charlie, just so we're clear, so, they know both sides.

Are you looking for, and I hate to use all of these acronyms, but are you looking for the electrical cartoon or schematic, let's call it, of the digital electro-hydraulic control over-speed protection control trip function?

MEMBER BROWN: The normal control and the trip function.

CHAIR STETKAR: You're also looking for the normal control function?

MEMBER BROWN: Yes.

CHAIR STETKAR: Okay.

MEMBER BROWN: Just to see how that --

CHAIR STETKAR: I just wanted to make sure that --

MEMBER BROWN: How they are separated.

CHAIR STETKAR: Fine, fine.

MEMBER BROWN: Because they talk about how it's suppose to be a certain configuration. I'd just like to see what --

CHAIR STETKAR: Yes.

MEMBER BROWN: I love words, but I read words and I can't form --

CHAIR STETKAR: I just wanted to make sure that for clarity, you also wanted to see how the normal control --

MEMBER BROWN: Right.

CHAIR STETKAR: The DEHC normal control --

MEMBER BROWN: Is.

CHAIR STETKAR: -- is accomplished and how that interfaces with the normal -- with the over-speed

protection control trip function --

MEMBER BROWN: Right.

CHAIR STETKAR: -- of that system, of the normal control system.

MEMBER BROWN: The normal control system and how they --

CHAIR STETKAR: The normal control system, you understand the kind of drawing he is looking for?

MR. REDDY: Yes, sure, I understand.

MEMBER BROWN: My point is, I would want to see that in the DCD, so, that it's documented as to what this --

CHAIR STETKAR: Right.

MEMBER BROWN: -- functional configuration looks like, similar to what you did for the independent electrical over-speed trip, where you show the three independent sensors and you show the four CPU's and they go out and they crunch stuff, and then you come out with a two-out-of-four trip that goes off to the safety logic system.

I was -- that one, I haven't been able to check, because it didn't look like it interfaced into -- I don't know how the trip is generated.

That interface, I went off and looked -- tried to find it in the safety logic system diagrams,

and so, I couldn't see how that independent electrical functional diagram went over to the SLS.

Now, how does it get back and trigger a reactor -- a turbine trip, without being involved with any of the other reactor trip features, because most of the reactor trip features come through the SLS system, when you're combining them all.

I mean, if you get one, you get -- if you get a reactor trip, you're suppose to trip the turbine, as well, etcetera.

MR. REDDY: Yes.

MEMBER BROWN: So, I was looking for that interface to be integrated, as opposed to having a break on one page and then disappear someplace else.

MR. REDDY: Yes, Mr. Brown, before I defer my response to Dinesh, I'd like to say one thing.

There were RAI's, initially issued in the 2008 and 2009, and in response, they provided some schematics, which Dinesh, you know, he will report of his evaluation of the control systems, and what I'd like to do --

MEMBER BROWN: In Chapter 7?

MR. REDDY: Not Chapter 7. Chapter 7, I didn't read that.

MEMBER BROWN: In Chapter 10?

MR. REDDY: Chapter 10.

MEMBER BROWN: Okay.

MR. REDDY: What I'd like to do is, I'd like to take this point and maybe go through those with Dinesh, and come back to you, whether those schematics are in the SFAR mark-ups. If not --

MEMBER BROWN: If they're in the mark-ups, fine. All I've got is Rev 3 not marked up.

Now, the RAI-4754, the one you all have -- that might not be the right number.

MR. REDDY: Yes.

MEMBER BROWN: I took a quick look through the mark-ups and didn't see any of that.

MR. REDDY: It is not there. Actually, it is not there.

MEMBER BROWN: Okay.

MR. REDDY: That's why, you know, here, they're marked as Rev 3, and I read -- and he read Rev 3, and I didn't see anything of those -- these mark-ups, actually.

MEMBER BROWN: Yes, in the RAI, I didn't find them, either. That is what I'm saying. They supposedly -- this has the DCD mark-up in it, and I didn't see it in there.

CHAIR STETKAR: Let me -- the good news

is, this is still the SER with open items.

MEMBER BROWN: Yes, I got that.

CHAIR STETKAR: So, we're not -- you know, we don't need absolute finality of everything --

MEMBER BROWN: Okay.

CHAIR STETKAR: -- at the moment.

MEMBER BROWN: Oh, no, that is the --

CHAIR STETKAR: But I think Charlie's desire is pretty well vocalized.

Where those drawings eventually show up in the FSAR, whether they're in Chapter 7 or Chapter 10 is less important then the fact that they're eventually documented somewhere.

MEMBER BROWN: Yes, you don't need to resolve that with me today. All I want to do is make sure we see what that mark-up looks like --

MR. REDDY: Sure.

MEMBER BROWN: -- before, you know, we put the Betty Crocker/Good Housekeeping seal of agreement on it. I won't say approval, I'll say agreement.

MR. REDDY: As I said before, what we like to do is, I'll discuss it with Dinesh, after he responds partially, then we will sit down with you and see what exactly, you are looking for, and then we will look --

MEMBER BROWN: But if you send me the mark-up, I can probably short-circuit and see if it's in there, then you don't have to do -- you know, then --

MR. REDDY: Okay, that's fine.

MEMBER BROWN: -- we can make this a little easier than --

MR. REDDY: But if it is not there, then we'd like to --

MEMBER BROWN: That's a problem.

MR. REDDY: Right.

CHAIR STETKAR: Dinesh?

MR. TANEJA: Mr. Brown, are you -- yes, I guess I'd want to --

CHAIR STETKAR: Dinesh, just for the record, make sure you've got your full name.

MR. TANEJA: Yes, okay, I'm Dinesh Taneja from the Office of New Reactors DE.

I, you know, provided the input on the SER for the over-speed INC part of it, and I just want to understand that, you know, the description that they provided, you know, I felt was adequately describing --

MEMBER BROWN: For the over-speed trip circuit?

MR. TANEJA: For the -- you know, for the normal speed control.

MEMBER BROWN: Yes.

MR. TANEJA: Over-speed trip, mechanical over-speed trip.

MEMBER BROWN: Yes.

MR. TANEJA: And some of the figures which are very high level figures, I thought were adequately supporting the text that was in the DCD.

MEMBER BROWN: I didn't -- I couldn't dig that out. I read the words and I looked at the figures that were at least -- I see in there, and I couldn't connect the dots on the normal speed control.

I didn't even connect the dots on the over-speed trip independent one until I saw the RAI-21 whatever it was.

MR. TANEJA: Right.

MR. REDDY: Forty-one-fifty-seven.

MEMBER BROWN: Twenty-one-forty-seven or 57 or what have you.

MR. TANEJA: Yes, you know --

MEMBER BROWN: It is those types of figures that I'm looking for --

MR. TANEJA: Right.

MEMBER BROWN: -- so, that words get

translated into something where you can envision and see what those words mean.

Those words can be interpreted and, you know, and designed, other than what the vision is, based on reading the words.

MR. TANEJA: Yes, I just want to understand exactly, you know, which, you know, figures that you think are deficient, that we need to get them to --

MEMBER BROWN: They don't exist. It's the electrical functional diagram --

CHAIR STETKAR: Dinesh, as I understand it, let's let -- let see if I can understand what Charlie is asking for.

There is a figure in the RAI response, and I think it's duplicated in the draft FSER, of the electrical over-speed trip function.

It shows three speed sensors. It shows a cartoon of four channels, signals going out and things like that.

MR. TANEJA: Right, right.

CHAIR STETKAR: I think what Charlie is looking for is a comparable figure, at that level of detail, for the digital electro-hydraulic control functions, and if I can call it that, one of the two

functions is normal speed control.

MR. TANEJA: Right.

CHAIR STETKAR: The other function is the over-speed trip function.

MR. TANEJA: Right.

CHAIR STETKAR: They share the same speed sensors. So, I think Charlie is looking for, if I can put words in his mouth, a comparable drawing that shows that normal control function and the over-speed trip function of the DEH-C system, and how the speed signals come out.

Do they go to common -- you know, are they common processing cards, CPU's, whatever you want to call them, that sort of level of information, and I don't think that type of drawing exists anywhere.

MR. TANEJA: Right.

CHAIR STETKAR: If it does --

MR. TANEJA: The figure that they provided with the RAI response, the 10.2-3, that simplified schematic --

MEMBER BROWN: That is hydraulic.

MR. TANEJA: Hydraulic, no, if you look at the right --

MEMBER BROWN: That little right-hand corner shows that one --

MR. TANEJA: No, no, that little one --

MEMBER BROWN: That is not good enough, come on.

MR. TANEJA: Yes, that shows a separation between --

MEMBER BROWN: That shows that we've got a system. There is one box and there is a bunch of -- and that's it.

MR. TANEJA: Well, you know, I guess what I'm asking is, are you --

MEMBER BROWN: For you to pull it up.

MR. TANEJA: -- looking for the DEH to be exploded a little bit more? Is that the --

MEMBER BROWN: Yes, like the -- this.

MR. TANEJA: Like the turbine -- this is the --

MEMBER BROWN: Like that one.

MR. TANEJA: Right, this is the turbine protection system.

MEMBER BROWN: Yes, yes.

MR. TANEJA: Which is shown on the top end of this little figure on the bottom.

MEMBER BROWN: The box, with no details.

MR. TANEJA: Right, so, you're looking for the DEH to be exploded a little bit?

MEMBER BROWN: Like that one.

MR. TANEJA: Okay.

MEMBER BROWN: And not more detail --

CHAIR STETKAR: Not necessarily more details than that.

MEMBER BROWN: No, like that one.

MR. TANEJA: I see, yes.

MEMBER BROWN: That is an acceptable level of detail.

MR. TANEJA: Okay.

MEMBER BROWN: Probably, based on what you've produced, okay, and the other piece to that is on that one, it shows going to the SLS --

MR. TANEJA: Right.

MEMBER BROWN: -- to generate the trip.

MR. TANEJA: Right.

MEMBER BROWN: I went searching for how that got done.

MR. TANEJA: Yes.

MEMBER BROWN: It's the safety logic system.

MR. TANEJA: Right.

MEMBER BROWN: So, that comes back, and you know, somehow the safety logic system comes back for that circuit and generates the turbine trip.

MR. TANEJA: Right.

MEMBER BROWN: And I've tried to stitch that, and I went off to the DCD, to try to -- Chapter 7 --

MR. TANEJA: All right.

MEMBER BROWN: -- and I couldn't put -- you know, you've got it in two different -- you know, one is on Saturn and one is on Neptune.

MR. TANEJA: That is true.

MEMBER BROWN: I couldn't connect the dots, as to how --

MR. TANEJA: That is true.

MEMBER BROWN: -- I got the appropriate trip, to get down to that mechanical stuff that you've got in figure 10.2-3.

MR. TANEJA: Yes.

MEMBER BROWN: So, that is the second piece --

MR. TANEJA: Yes.

MEMBER BROWN: -- to see how you actually get that signal through the SLS and down to the trip functions.

MR. TANEJA: We are, right now, in the midst of going through all Chapter 7 review, and I did trace it to Chapter 7, where the hard-wired turbine

protection signals come into the SLS, each division of the SLS, right, and then in turn, the SLS sends out a signal to each individual turbine trip solenoid.

I think there are four division of SLS, so, each division sends out a signal to the separate turbine trip solenoid, right?

MEMBER BROWN: Dinesh, I understand that, but I --

MR. TANEJA: So, I did trace one that --

MEMBER BROWN: I can tell that's got a carburetor. I've got a couple of pistons. I've got, you know --

MR. TANEJA: So, we'll talk about that when we get to Chapter 7.

CHAIR STETKAR: Dinesh, by the way, that is for the emergency over-speed trip function --

MR. TANEJA: Correct.

CHAIR STETKAR: -- that in deed, has four channels and four valves.

MR. TANEJA: Right.

CHAIR STETKAR: It has nothing to do with the --

PARTICIPANT: Pistons.

CHAIR STETKAR: -- with the over-speed protection control trip function --

MR. TANEJA: Correct, right.

CHAIR STETKAR: -- which only has two valves and some sort of interface with something else.

MEMBER BROWN: Exactly.

CHAIR STETKAR: And that's the -- the some sort of interface with something else is basically, all we know.

MEMBER BROWN: That's right.

CHAIR STETKAR: At that level of detail.

MEMBER BROWN: So, the same issue applies to that, relative to once it -- once it trips, what does it do and how does it go back, integrated, not giving me a wheel and a tire, the steering wheel and a carburetor and engine block and telling me, "That is the car."

MR. TANEJA: There is -- you know, I guess I was able to trace it to Chapter 7, the turbine protection system.

MEMBER BROWN: Well, I got -- I figured it was in Chapter 7.

MR. TANEJA: Right.

MEMBER BROWN: That is as far as I --

MR. TANEJA: Right, that SLS is in there, so, we were able to track that down.

MEMBER BROWN: Sure, I'm not smart enough

to do that.

CHAIR STETKAR: Well, pretty clear on what --

MR. TANEJA: Yes, I think I understand what you're looking for.

CHAIR STETKAR: Okay.

MR. TANEJA: We are looking for another figure, which explains the turbine control system.

CHAIR STETKAR: Right.

MR. TANEJA: Right.

MEMBER BROWN: So, words are reflected in a something, that you can say, "This is concrete. That's what you would expect to see."

MR. TANEJA: Got it, okay.

MR. REDDY: I would like to make one point, here.

Actually, this thing, probably, you don't have it, the mark-up.

CHAIR STETKAR: Not only probably, it's a fact. We don't have it.

MR. REDDY: So, we are sure -- we'll make sure that this will be reflected in the future revisions.

CHAIR STETKAR: Okay.

MEMBER BROWN: I don't even think the

RAI's has a mark-up like that. That is something else.

MR. REDDY: So, if you don't have any other questions?

CHAIR STETKAR: I only have one more question, that is related to turbine trip, and it's a statement in the SER, that I'm not sure is technically correct.

It's in Section 10.2.4.1.3, if you want to trace it down, but it stated that all solenoid-operated air or hydraulic control valves for steam valves are designed to fail open if de-energized, upon loss of electric power to them, to effect shutting of the steam valves whose hydraulic or air actuators they control.

Therefore, all the turbine valves are closed, due to loss of pressure in the air and/or hydraulic fluid lines if they are broken, or due to loss of electric power.

I believe that that statement is true for the electrical over-speed trip solenoid operated valves, the four valves that Dinesh mentioned.

I do not necessarily know whether that statement is true for the over-speed control trip solenoid valves, because they are arranged in a one-

out-of-two logic, and such, if I lost power to either of those solenoids, I would trip the turbine, and that, to me, is a strange design.

So, the question is, are the over-speed control OPC trip solenoid valves designed to open on loss of power to their solenoids? That is a question, perhaps, for you or for MHI.

MHI, if you have that answer, if the staff doesn't, I would appreciate it, because if they require power to open those valves, then the statement in the SER is a bit misleading, and if some of your conclusions about the reliability of the trip function are based on the de-energize, either of those trips functions to trip the turbine, it may need some re-thought.

So, are the -- MHI, do you have an answer? Are the over-speed protection control OPC trip solenoid valves designed to open on loss of power to the solenoid, or do they require electrical power to open those valves?

There is a microphone here, actually, this one picks up a little better than those.

MR. MINAMI: This is Minami, again, and I am not expert of the turbine control system, but the OPC over-speed protection control is the part of

turbine control system, and we have two solenoid valves for OPC.

And the two -- the solenoids valve is closed by supplying the power, and if we loss the power, solenoid power -- will be opened and --

CHAIR STETKAR: So, if I understand the design correctly, that means if I loss power to either of those solenoid valves, because they're two valves in parallel --

MR. MINAMI: Right.

CHAIR STETKAR: -- I will have a turbine trip?

MR. MINAMI: Yes, you will have a turbine trip.

CHAIR STETKAR: So, you designed the emergency over-speed trip with double-redundancy, so that loss of power to any single solenoid valve will not trip you from the electrical over-speed trip, but loss of single -- loss of electrical power to either of the two OPC valves will cause a turbine trip?

If that is the design, that is the design, but I want to make sure that we understand the design.

I mean, it's -- somebody buys the turbine and somebody likes to have reliability and --

MR. TANEJA: Let me, you know, in the RAI

response -- in the RAI response, I read a statement in Section 10.2.2.3.1.5, which is the over-speed protection.

It says that solenoid valves are energized and a drain path for the hydraulic fluid opens in the emergency trip header.

CHAIR STETKAR: Oh, that is clear. I am just --

MR. TANEJA: So, this is --

CHAIR STETKAR: I am just --

MR. TANEJA: This is different, right? Energized, that means that the path opens. So, they're saying de-energized -- any de-energized --

CHAIR STETKAR: I found doubly redundant statements that I can trace in the electrical over-speed trip hydraulic description EOST, that says that those valves are normally energized closed, and I need -- the way they're oriented, I need two -- it's not a direct two-out-of-four.

MR. TANEJA: Right.

CHAIR STETKAR: I need two valves and one flow path, or two valves and the other flow path to open, to drain the hydraulic fluid.

MR. TANEJA: Correct, that's right.

CHAIR STETKAR: And it's pretty clear that

they go open when you lose power.

MR. TANEJA: Right.

CHAIR STETKAR: So, I'm not questioning how those valves -- it's the other side of that hydraulic picture, where you have only two valves in parallel.

So, either valve opening seems to drain hydraulic fluid, and that's the OPC trip part of the circuit.

The question is, do those valves also fail in the open position on loss of power, and that, I couldn't find.

MR. TANEJA: No, that's what I am --

CHAIR STETKAR: Okay.

MR. TANEJA: In the RAI response, it's contradictory to, I think, what I just heard.

It says that the valves open the drain path when they're energized, the OPC valves.

CHAIR STETKAR: Okay.

MR. TANEJA: So, that means you have to energize them to --

CHAIR STETKAR: Okay, if that -- if you have that in writing -- let's see if we -- let's just see if we can get clarification on it from the staff and MHI, and move forward on this.

MR. TANEJA: Right.

CHAIR STETKAR: You understand the question? It's what is the failure mode of those OPC trip solenoid valves when you loss power to them?

MR. MINAMI: I'm sorry, maybe I gave you a wrong answer.

CHAIR STETKAR: Okay, that's --

MR. MINAMI: And I will confirm.

MR. TANEJA: Right, I'm just looking at the --

CHAIR STETKAR: Let's just get confirmation.

MR. TANEJA: Yes.

CHAIR STETKAR: Because if they require power to open, you may need to revise some of the -- and my question is --

MR. TANEJA: Right.

CHAIR STETKAR: -- there is a conclusion about the reliability of the trip function from the staff's review, based on the notion that any of those valves would open on loss of power, or -- or did you base your conclusion on an understanding that some required power to open and others did not require power to open?

MR. REDDY: That was actually -- what he

said is true, because I remember that for the emergency stream, all the studies I have seen in the responses and in the mark-up, it was FSAR.

But I think, you know, the other one, I think we'll look into that.

CHAIR STETKAR: Okay, good, thanks.

MR. REDDY: Okay, anything else, actually? If I don't have anything on the systems, then I'll -- John and Charlie can be taking over for there.

Besides that, do you have anymore questions?

CHAIR STETKAR: No questions about turbine rotor materials or anything?

MEMBER SHACK: No, he's going to start.

CHAIR STETKAR: Oh, he's going to start? Okay, I'm sorry. I lost track.

MR. TANEJA: John, before you get started, I can answer this morning's question about, you know, where does the signal for the reactor trip come from?

CHAIR STETKAR: Yes.

MR. TANEJA: You know, this is in 7.2. So, the oil pressure -- there are four sensors on the emergency turbine oil pressure.

CHAIR STETKAR: Okay.

MR. TANEJA: Which are, you know, treated

as associated circuits, you know, independent. They're non-safety, naturally, because they're in the turbine building.

So, they go into the reactor protection system, individually. That is the primary signals that come in, and then the turbine stop valve signals.

So, there are two limits, which is in turbine stop valve. So, those are, you know, kind of back-up and those are used as a back-up for the --

CHAIR STETKAR: But those are also non-safety?

MR. TANEJA: Non-safety, yes. They're called out in the DCD as associated circuits.

So, they are strictly used for the reactor protection system. They're not used for anything else.

CHAIR STETKAR: There is no requirement? I'm rather thin on my own personal knowledge on requirements for reactor trip input signals being from safety related instrumentation.

MR. TANEJA: I think --

CHAIR STETKAR: Are there analyses to be done -- are there analyses done that -- suppose these non-safety related sets of sensors, both the hydraulic sensors and the --

MR. TANEJA: Limit switches?

CHAIR STETKAR: -- and the limit switches fail? Are there analyses done that show that I get a successful reactor trip under any condition that will challenge a turbine trip, before I challenge any safety function, any other, you know, safety limits?

In other words, what are the safety related back-ups to those non-safety sensors, or you know, is there a requirement that that needs to be demonstrated?

MR. TANEJA: Well, you know, I think it is the same scenario that we have at the operating plants right now.

CHAIR STETKAR: Well, I've seen other plants that have designated those things as safety related, and they required separate protection for them.

MR. TANEJA: Well, you know, they do treat the, but you know, because the turbine building is non-seismic, so, we can't really get them to a full pedigree of safety related, okay.

So, they are independent from performing any turbine control function or turbine, you know -- they are strictly dedicated for reactor protection systems, okay.

So, you know, the circuits, the wiring and the sensors are treated as, you know, safety related, but they cannot be pedigreed as full safety related because they're located in turbine buildings.

CHAIR STETKAR: Understand.

MR. TANEJA: Right, so, and I think that scenario is exactly similar to what we have in the existing operating plant, you know.

CHAIR STETKAR: But you know, as I said, I, personally am not familiar. But thanks, at least you confirmed where they --

MR. TANEJA: We'll go over that when we go over Chapter 7.

CHAIR STETKAR: Okay, yes, that's fine.

MR. HAMZEHEE: John, we have 10 minutes and John's presentation may take a little more. Do you want to continue or do you want to break?

CHAIR STETKAR: If -- let me ask --

MEMBER BLEY: We can be a little bit late.

CHAIR STETKAR: Okay?

MEMBER BLEY: Five or 10 minutes will be okay.

CHAIR STETKAR: Five or 10 minutes? Can you get done by about 10-past, do you think, John?

MR. HONCHARIK: Yes, I think so.

CHAIR STETKAR: Okay, let's try to get through the material -- your presentation and then break. Dennis had another commitment at noon, and I didn't want to do that.

MR. HONCHARIK: All right.

CHAIR STETKAR: So, let's see if we can get through this one.

MEMBER SHACK: John's question is -- or there are open items.

MR. HONCHARIK: Yes, I have several open items.

CHAIR STETKAR: Well, I mean, you know, if we can get through it in less than 20 minutes, that would be great, too.

MR. HONCHARIK: Okay, yes, my name is John Honcharik. I'm a materials engineer at NRO for the Division of Engineering. I'm going to talk about the turbine rotor integrity. First, we'll talk about the material properties.

Section 10.2.3 for the APWR DCD describes the material used and -- which is based on ASTM material spec A470.

Previously, this section specified that the materials met the chemical properties for Grade C, for Classes 5, 6 and 7, and that the impact succeeded

that of Grade C, Classes 6 and 7.

But however, in the Rev 2 to the DCD, the grade and class of this material were deleted. So, I guess the staff had an RAI that requested that only the class of material that's bounded by the turbine missile probability analysis should be included in the DCD, such that the material that's in the DCD should be what's been used in the turbine missile analysis.

So, therefore, the staff identified this open item 10.2.3-1, so that the Applicant would include in the DCD, you know, the specific grade and class of material, or reference to a specific material ordering requirement that bounds the turbine missile.

They had provided a lot of detail of the chemistry and some of the mechanical properties in RAI responses. As they said before, you know, that's proprietary information.

So, basically, that's what the first open item was.

Second was MHI also provided some impact testing requirements, you know, basically for Charpy V-notch and the 50 percent FATT, and that was in an RAI response, and basically, it did not meet the acceptance criteria that's given in SRP 10.2.3.

In addition, the DCD did not include the

number of specimens being tested and it's location for the bored and non-bored rotors.

Therefore, the staff has an open item 10.2.3-2, to revised the DCD to include, you know, the number of specimens tested and discuss why the specified 50 percent FATT and Charpy V-notch energy is -- ensures adequate fracture toughness as stated in SRP 10.2.3.

Related to that, the staff also has an open item 10.2.3-3, which requested that the methodology for calculating the fracture toughness value, for the turbine material being included in the DCD. Next slide?

MEMBER REMPE: This should probably come from Bill, rather than me, because I don't know enough about what I'm talking about here.

But in the actual SER, it talks about the location of where the specimens are obtained, and are you going to discuss that at all, or is that an issue that just went away, whether it's in the periphery of the bore or the center?

MR. HONCHARIK: Right, well, that's still ongoing. As I said, we have other RAI's out there, and also, they have some responses, but I think there is probably additional RAI's going out. So, we're

still reviewing this.

MEMBER SHACK: Yes, I assume that's part of that open item on obtaining the fracture toughness?

MR. HONCHARIK: Right.

MEMBER SHACK: Like, where is the material from?

MR. HONCHARIK: Right, and I guess, you know, we can discuss it now, that -- yes, the main problem we have is that, you know, the DCD kind of leads you to believe that you could either have a bored rotor or a non-bored rotor, okay.

MEMBER SHACK: Doesn't lead you to believe, but it states that, doesn't it?

MR. HONCHARIK: Well, somewhat, okay. So, for the bored rotor, you know, that's typical, what's out there currently.

So, for the non-bored, the solid rotor, you know, we had some questions about, "Well, how do you ensure that, you know, that material that you have, you know, in this large forging, in the center, is, you know, suitable?"

They had provided some information in the RAI responses, and it just wasn't cutting it. We asked them other ones, and they provided some information where they actually did some testing for

bored rotors and took material from the bore, you know, that bore material from the center, and actually did Charpy's and calculated FATT and everything else.

And you know, got some correlations from the -- what you can get from periphery to the core, such that, you know -- can -- you know, with their process for making, you know, these large forging's, using this material, what would be the material properties for that?

So, I think they're providing some of that information with the material correlations from previous inspections, you know, from making the bored rotors.

So, I think we're kind of getting to agreement on that part, you know. That is not reflected here in that revision of the -- but you know, it will probably be in the next one.

So, I think in that respect, for the mature properties, we're kind of seeing, you know, how they're approaching that, and that's similar to another design that's doing pretty much the same -- similar tact.

The other question is, what I'm going to discuss here, is how the -- is the inspections of these, you know, large, solid rotors, because

previously, bored rotors, you would do, you know, your volumetric UT from the ID from the bore.

Now, here, you don't have that bore. So, now, how can you -- you know, what is the inspection capabilities for these large, solid rotors, and can you actually detect flaws in there, and what's the reliability and capability of those?

As this slide says, you know, they provided some criteria, you know, that's going to be visual surface and volumetric inspection, it's going to do it every 10 years, and -- but you know, but we're still looking for some operating experience for these solid rotors, and whether or not -- you know, what's the reliability of detecting flaws in those solid rotors?

So, I think we're still kind of working through that process, too, right now.

So, that is why we still pretty much still have open items on that. I don't know if you want to discuss anything else, or --

CHAIR STETKAR: Well, I mean, I don't know exactly how you're going to qualify those ultra-sonic techniques. You know, that was a question that I was going to -- you know, when MHI said they were going to do 100 percent ultra-sonic, well, you can do the 100

percent ultra-sonic.

MR. HONCHARIK: Right.

CHAIR STETKAR: What are you going to find, and you know, I assume that's your major question.

MR. HONCHARIK: Right, basically, you know, can you actually do the examination and can you find something, which would be the --

CHAIR STETKAR: Of interest, yes.

MR. HONCHARIK: Right, yes, you know, and I would guess, basically, you know, how will it relate to their turbine missile analysis?

You know, they assume certain size flaw, you know, in there. Okay, can you -- will you be able to detect that? They kind of use the lower size, so, would they be able to detect it?

More than likely, they probably would, you know. There is another design out there, also, I think that is trying to do UT of this, too, and I can't remember exactly, it's a specialized UT phrased array that I think they're using for this.

So, but that's what we're asking for, is some information on that and operational experience of these rotors and inspections of these rotors, because there is a lot of -- I guess, people are saying that

they have been using these rotors, you know -- and you know, so, obviously, they should be doing some inspections of them, so, they can provide that information.

Because I think a lot of, even existing plants are using solid rotors now, to replace some of their low pressure, you know, turbine rotors.

CHAIR STETKAR: So, you've accepted solid rotors?

MR. HONCHARIK: Well, it seems like for the existing plants, yes. So, I just want to get confirmation to see how this applies to this design.

CHAIR STETKAR: Charlie, do you have a question or are you just --

MEMBER BROWN: Yes, I just want to back-track. These are 'yes' and 'no' answers to two questions. Is that okay?

CHAIR STETKAR: Well, fine.

MEMBER BROWN: I want to go back to the trip system --

CHAIR STETKAR: Yes.

MEMBER BROWN: Until I saw these --

CHAIR STETKAR: Let's try to close out anything to do with turbines or turbine trip, because after lunch, after we break for lunch, I want to ask

the staff to come back, because I think we have some other questions about other systems.

Your presentation is focused pretty much only on the turbine and turbine control protection, and we don't have enough time to go through those questions.

So, Charlie, let's get to your's for now.

MEMBER BROWN: Particularly, with the notion -- when I got the experts here.

The figure shown for the electrical over-speed trip shows three sensors, one feeding -- well, they all feed all four of the processors, quadruple-redundant processors. Are the sensors passive or active?

MR. TANEJA: We don't have that information in the DCD. They are the same sensors --

MEMBER BROWN: As for the normal speed controls. My question is --

MR. TANEJA: The same --

MEMBER BROWN: Well, that's fine, but are they passive or active, is what I'd like to know? You don't know?

MR. TANEJA: We don't know. We don't know that. It's not in the DCD, what type of sensors they are.

MEMBER BROWN: Okay, second question is, they show four processors, each generating its own trip, and then there is a voting system, after that, okay.

Does each of those processors have a separate power supply, or are they a common power supply for all four processors?

MR. TANEJA: It's a redundant set of power supplies.

MEMBER BROWN: What does that mean?

MR. TANEJA: I believe, the way I understood, you know, it's not described in detail, but there is a redundant set of power supplies, which power all four of these channels.

MEMBER BROWN: Okay, then, so, you're -- so, you think that's another reason for the figure?

MR. TANEJA: Yes.

MEMBER BROWN: Okay, for each of these CPU's, do they each have two redundant power supplies for each CPU, or is it just a pair of redundant? Does it feed all four CPU's?

You don't have to answer it, I just would -- we'd just like to have --

MR. TANEJA: I don't have the details.

MEMBER BROWN: We just don't have what is

envisioned, and because I'm looking at coupling here, okay.

If you have just one pair of redundant power supplies that feed all four of the over-speed trip processors, you're walking you way into a potential trap, in terms of a common mode failure.

The reason for the active versus passive, the next question that goes with that is, there is an input module shown, and I've made an assumption, not necessarily true, that the sensor output goes to the input module, and then an analog signal is generated, it's like a signal conditioner, that sends in an analog signal to the inputs on each of those -- you know, the three inputs that go into each processor.

That is one of the reasons for active or passive, because it's another source of a common mode failure, to have noise or something get in there compromise the processors.

I bring that up, if somebody wants to argue with me, on the two power supplies for all four, because of direct experience with one system that I was -- I didn't do myself, but got involved in the solution, was that noise, out of one of the power supplies, not the other one, completely disabled the over-speed trip, in two different channels, because

there was a common set of power supplies that fed the redundant trip circuits. I like to call them trip circuits.

That really happened and not only that, it also fed the normal control circuit, which that is the next question, because the EOST is part of -- is in that cabinet, do those same redundant power supplies also feed the normal control circuit?

Because at the same time, those -- when that noise came in, it told the speed control to speed up.

So, simultaneously, people say this never happens, but it really does, it stood up the turbine, shut down the over-speed trip circuit and if it hadn't been for an operator that was about five feet away, hurling -- listening to that sucker really speed up, he got over and tripped it at about 148 percent over-speed. The design was at 150.

So, the question is -- that is why all the words are great, but how they're reflected in an actual figure to show what is the intent of the words, in terms of the design of the system, that is the basis for trying to get some detail functionally, as to what the configuration of power supplies, processors and the nature of the active or passive

sensors that go into it, that is the reason for my question and that is why -- one of the reasons, I'm interested in this, each time it comes up, and the figures are worth 1,000 words, which don't get confused as easily. That was it, John. Thank you.

CHAIR STETKAR: Any other questions for these folks?

One telegraphing thing for Chapter 3, and I was going to try to avoid this, but since Charlie brought up a lot of questions about the details, I will tell you, as a fact, that the turbine missile analysis and the turbine over-speed analysis that has been submitted in the technical report contains precisely no evaluation of the reliability of anything that Charlie has mentioned, nor the reliability of any of the hydraulic valves that open to trip the fluid, nor any of that. That is a fact.

So, it is not clear to me, how one can do the over-speed analysis, just looking at the turbine stop valves and control valves, which is all that is in there.

So, if you guys have reviewed that and have approved it, you may want to think about that, again.

Now, with that --

MR. REDDY: Is it in Chapter 3?

CHAIR STETKAR: You know, I haven't seen Chapter 3, so, I have no idea what your review of that technical report is.

There is a technical report that MHI has submitted, that contains the details of the turbine over-speed analysis, that purports to justify why the frequency of generating turbine missiles -- I'm sorry, why the frequency of exceeding -- of reaching a destructive over-speed condition, I have to be careful, is less than 10 to the minus five per year.

That analysis does not evaluate the turbine protection electronics, the speed sensors, the valves, anything. It just doesn't. It's by the way, a copy of an analysis that I've seen for another design center, to that point that it has the same words in it.

MR. HAMZEHEE: Yes, John?

MEMBER BROWN: Now, that I saw the RAI and was able -- I mean, I hate reviewing stuff on the spot here. He asked about ITAAC, if you had any questions on ITAAC, and on the mechanical over-speed trip test, I noticed that the item is suppose to be tested or inspected, once a month.

I guess my question is, how do you test

the over-speed trip, the mechanical one?

CHAIR STETKAR: There are ways to do it.

MEMBER BROWN: I understand that, I've done it in the past. Normally, we would --

CHAIR STETKAR: I've done it in turbines.

MEMBER BROWN: Yes, we over-sped the turbines, so they trip.

CHAIR STETKAR: I know how to do that.

MEMBER BROWN: So, my question is, what do they intend, when they say they're going to test or inspect it, once a month? Are they really going to -- is the intent really to over-speed the turbine to 100 --

CHAIR STETKAR: No.

MEMBER BROWN: Well, then -- I just want to know how -- I just want to know what the intent is.

MR. TANEJA: Okay.

MEMBER BROWN: All right, I'm not advocating speeding it up once a month, to 110 percent, okay, that is not my point.

MR. HAMZEHEE: John, before we adjourn, are you planning to talk more about Chapter 10 after lunch?

CHAIR STETKAR: Yes, yes, I have -- I think we -- some questions came up earlier, on nothing

to do -- I wanted to close out anything on the turbine, but emergency feedwater system, there are certainly a few questions. I had a couple of questions on other system related things.

MR. HAMZEHEE: So, you also recognize that we have Chapter 8 and 9 for COL?

CHAIR STETKAR: I do that, I also see that our agenda says that we're going to adjourn at 4:30 p.m. and I note that I don't have a life, so, I can be here until midnight.

With that, let's recess for lunch and come back at one o'clock.

(Whereupon, the above-entitled matter went off the record at 12:05 p.m. and resumed at 1:05 p.m.)

CHAIR STETKAR: Okay, we are back in session, and I apologize for the semi-empty room. We have another meeting going on, on another topic this afternoon, that we sort of had to muster forces for.

As I mentioned before we broke for lunch, a few questions came up in this morning's session, that I thought it might be worth while to at least pose to the staff, regarding other parts of the DCD Chapter 10 review.

You don't have answers to them, you know, immediately, recognizing that you didn't plan to

discuss those other issues, that's fine.

But I at least wanted to get them out on the record. If we can get answers, that is great. If we -- I'm sorry, lost my train of thought.

So, we're not expecting any presentation, obviously, and this is -- I hope, will be pretty quick, even if you don't have answers, it should be pretty quick.

Let me start with ones that I had, because I know that Joy had at least one, also.

One of the questions that came up, MHI -- there were RAI's regarding leakage past the check valves in the emergency feedwater system, a concern about steam binding or non-condensible gases getting into the piping, and as a result of those questions from the staff, MHI, in the DCD, I believe it's in the DCD, has summarized a brief procedure about what they would do.

The operators would be alerted by high temperature in that line. They would then take that train of emergency feedwater out of service. They would be under a 72-hour time clock, according to the tech-specs.

They would need to, you know, make the appropriate repairs to the leaking check valve. We

fill that section of piping with water and everything would be fine.

The question that I posed was how does that procedure guarantee that steam or non-condensible gases have not migrated backwards through the other check valve and are located at another high point in the piping system, if there is one, or in the pump itself?

Because simply by presuming that the check valve at the discharge side of the pump is absolutely 100 percent leak-tight, and that your -- by definition, the only problem is in that piping section between the two check valves, to me, doesn't necessarily guarantee that the system is operable when you fixed that first leaking check valve, the one that you knew about.

So, the question to the staff is, why -- why are you confident that that presumption, that the second check valve will not leak, is adequate assurance, without additional investigation that given the fact that one check valve leaked, could there be other places that the gases accumulated in that piping?

MR. STUBBS: Okay, my name is Angelo Stubbs. I'm the reviewer of the Balance of Plant for

the emergency feedwater, and I guess to answer your question, this is really a two-part question, when we send out our RAI.

We had sent out our RAI, I think the RAI-4, which asked them about that and about water hammer.

CHAIR STETKAR: Yes.

MR. STUBBS: And after we got responses back from RAI-4, they gave us some design considerations that they had, and part of that is the elevation of the pump being at lower elevation than other parts of the system.

And they also gave us what you -- and in our follow-up, they gave us the procedure -- what they would do for the water hammer, which I think they presented it here.

CHAIR STETKAR: Right.

MR. STUBBS: When we looked at that, our basis for accepting that was based on what was done to close out Generic Safety Issue 93, which was back in IE Bulletin 88-03, and what they prescribed was consistent with what that Generic Issue -- that Generic Issue Bulletin showed -- or had, and in that bulletin, there was a very high percentage of times that they found that that took care of the problem.

CHAIR STETKAR: But that is a water hammer

concern, right?

MR. STUBBS: No, that was a steam binding.

CHAIR STETKAR: That was steam binding?

MR. STUBBS: Right.

CHAIR STETKAR: Okay, I'm lost.

MR. STUBBS: Generic Safety Issue 93 was steam binding for auxiliary feedwater pumps.

CHAIR STETKAR: Okay.

MR. STUBBS: And as part of that resolution, it was Generic Letter 88-03, which spelled out, actually what I'm thinking was 85-01, it adopted recommendations from 85-01, but that spelled out some things that could be done to make sure that steam hammer wouldn't be an issue for the auxiliary feedwater pumps.

CHAIR STETKAR: You mentioned on thing that is important. You said that they did provide information on elevations.

MR. STUBBS: Well, I think in the RAI response, they were saying that -- I don't know, you know, that it gave out -- for every elevation, but I think there was some type of statement in there, that -- as part of the design, that even -- and I don't know whether they put it in the DCD.

But there was information, and maybe

Mitsubishi could speak on that, as to that -- that the pumps was at a lower elevation, and that it was less likely that you would get steam to be able to travel and cause steam binding in the pump. I thought I had that RAI response.

Let me see, I don't seem to be able to find it right now.

MR. KALLAN: We can always get back to you on that.

MR. STUBBS: Yes, we'll get that.

CHAIR STETKAR: Okay, why don't we --

MR. STUBBS: But that was our basis, you know. Once we received the response, we looked at what was put into close out that generic issue.

CHAIR STETKAR: And yes, you know, as you're aware, we don't get all of the RAI's and the responses.

MR. KALLAN: Right.

CHAIR STETKAR: So, a lot of the questions that come up are just from what we can read in the DCD and kind of infer from the SER conclusions.

MR. STUBBS: Right, but that was --

CHAIR STETKAR: If there is more details, to kind of give you confidence that in deed --

MR. STUBBS: Right, initially --

CHAIR STETKAR: -- that would solve the problem --

MR. STUBBS: -- we did get details about what they planned on doing, but we didn't have the information that there was going to be anything that the Applicant would have to do, to ensure that you got the --

CHAIR STETKAR: Yes, you know, what I was looking for was part of their procedure, if there were other high points in the system that they, in deed, would go vent those high points and make sure that the piping was full of water and that sort of thing.

But since they weren't mentioned --

MR. KALLAN: Usually, what we've been doing is, on the SER's with the open items, we only include those RAI's, but --

CHAIR STETKAR: Yes.

MR. KALLAN: -- we've been discussing it internally.

CHAIR STETKAR: Yes.

MR. KALLAN: We might start sending all of the RAI's to you.

MR. STUBBS: And just to --

MR. KALLAN: As a back-up.

MR. STUBBS: And just another point, this

review was done a few years ago. It was done just Rev 2, and I know you are saying that you're asking for clarification on drawings, so, we're going to have to go back and look to see that the system looks like it did back then, also.

CHAIR STETKAR: Okay.

MR. STUBBS: Because it seems that they've made some changes to the --

CHAIR STETKAR: The check valve, I don't think the position of the check valve --

MR. STUBBS: But we need to see what --

CHAIR STETKAR: You know, if they're taking credit for isolating the check valve --

MR. STUBBS: Yes, I wouldn't imagine that, that what it is, but we -- you know, as an overall system, we have to go back to look, to make sure that is what we think it was.

CHAIR STETKAR: Okay.

MR. STUBBS: Or what it was before.

CHAIR STETKAR: Okay, since we're talking about emergency feedwater, I'm trying to get my hands around this notion of what is the fundamental technical intent of NUREG-0611 and NUREG-0635, regarding operability or operation, regardless of which word you want to use, of a turbine driven

emergency feedwater pump for two hours, in a station Blackout condition?

Is the intent that -- is the fundamental technical intent, and I have not read those NUREG's, so, I don't know, if the fundamental technical intent that the turbine driven emergency feedwater pump, as a diverse defense-in-depth measure against ac required motor driven pumps, should be independent of any ac power, for a minimum of two hours, or is the intent that it can be dependent on ac power at some time within that two hour period?

Because it sounds like the interpretation for this particular design is the latter of the two, but the argument is being made that it's consistent with the requirements of those two NUREG's -- or NUREG's don't have requirements, but that are consistent with those NUREG's?

MR. STUBBS: Okay, I think when it came out, and I think it was 1981, this was before the 50.63 Station Blackout.

So, the intent was to have everything required to operate the pump -- for that pump to operate two hours.

Since then, the Station Blackout rule came out, 50.63, and it really -- it gave the utilities the

-- it allowed them to credit an alternate ac source, if they have one.

Now, in this case, if you don't have the -- if they can't conduct one for 10 minutes, they have to do a coping evaluation for the duration of time that it's not connected.

I guess at the time when they originally wrote them, because most plants didn't have alternate ac --

CHAIR STETKAR: That's correct.

MR. STUBBS: -- source, and maybe even now, most plants don't have alternate ac.

So, it really needed to be completely no alternate -- no ac power.

We looked at this and everything else besides the fact that the room temperature was, I think, sometime between an hour and two hours, exceeded 175 degrees or 50 degrees C, it had -- it had the battery back-up capabilities. It had the cooling water, everything was there.

The question was asked, because you know, as a reviewer, I was wondering whether there was something that would allow them to get there regardless, without the cooling units.

But I guess they -- that is not the --

that's all I got back, but they have two alternate ac diesels that are like 4,000 kilowatts.

We looked at what was loaded on them and the time that they are loaded. So --

CHAIR STETKAR: Yes, I looked at it. They load up the cooling water.

MR. STUBBS: Right.

CHAIR STETKAR: They load up the chiller units.

MR. STUBBS: Right, so --

CHAIR STETKAR: They load up the HVAC units that --

MR. STUBBS: So, with that, they have the two hour capability -- they have beyond a two-hour capability, that --

CHAIR STETKAR: As long as those non-safety related, non-seismic requalified alternate manually initiated, alternate ac gas turbine units work, they've got that.

MR. STUBBS: Well, that's true, but they -- we also looked -- you know, they do have to meet the requirements in Chapter 8 for the station blackout, you know, and the diversity and everything.

But the idea of two hours, I think in the early 1980's was because that was the only -- you

didn't have anything else. It wasn't possible to have anything else.

CHAIR STETKAR: The only reason I bring this up is --

MR. STUBBS: In this case --

CHAIR STETKAR: -- this is, I believe, the first design that I've seen, that in deed, does require a source of ac power to support a turbine driven pump for longer than -- to meet that two-hour nominal time. So, that is fair.

Now, whether other people didn't identify the room cooling dependancy is a different issue, but I think this is the first one that I've seen, that admits it could be a problem, and that is the only reason that I brought it up.

MR. STUBBS: To do that, this would be the first one, because we have the passive reactors and the EPR --

CHAIR STETKAR: You have passive reactors.

MR. STUBBS: -- and the EPR has --

CHAIR STETKAR: The EPR has all motor driven --

MR. STUBBS: This is the first one.

CHAIR STETKAR: Okay.

MR. STUBBS: It may have been on the

System 80+ in the past, but --

CHAIR STETKAR: That, I don't know.

MR. STUBBS: But this would be the first one of the new reactors that we've been presenting lately.

CHAIR STETKAR: Okay.

MEMBER SHACK: The Reg Guide has the one-hour thing. The station blackout Reg Guide has the one-hour.

CHAIR STETKAR: The station blackout has -- it's a requirement that you need to be able to supply power from that alternate ac source, within one hour.

MEMBER SHACK: Right, yes.

CHAIR STETKAR: Or if you can't, you need to do a coping study, to demonstrate what your coping period is.

From an electric power supply, I know what that says, but my question was more toward, you know, regardless of that electric power supply, what is the intent of the turbine driven design, because you know, if in principle, I had huge steam generators that I could boil off for an hour and a half, why have a turbine driven pump, if I can guarantee an electric power supply for a motor driven pump?

MEMBER BROWN: You said an hour, but when I looked at Chapter 8, it said if the alternate ac source -- and this is from 10 CFR 50.53.c2 or something like that.

The ac meets the above requirements, can be demonstrated by testing the powers available to the shut-down buses within 10 minutes. What is the difference between 10 minutes and one hour?

MR. STUBBS: That is the -- if they do it within 10 minutes, they don't have to do the coping --

CHAIR STETKAR: The coping study.

MR. STUBBS: -- for that one hour. But they can't do it within 10 minutes, so -- and this -- in this situation, they have to actually do a coping analysis for the first hour, to show that.

CHAIR STETKAR: I probably said it in reverse when I --

MEMBER BROWN: Well, they just -- after you said it, I went and I didn't --

CHAIR STETKAR: Okay.

MEMBER BROWN: I saw the 10 minutes and I didn't --

CHAIR STETKAR: In the interest of time, I think, you know, we'll probably revisit this. I don't -- you know, from my perspective, it's just

something that is a bit different, because as I've said, we've not seen this type of design for a non-ac powered emergency feed -- whether it's emergency feedwater or whether it's HIPCI or RCIC for a boiler or any type of turbine driven non -- nominally non-ac dependent cooling water source, we haven't seen one that has this particular design feature, if you will call it that.

MR. STUBBS: And that is because we actually don't need it for the turbine pump, it's just that because of the environmental conditions.

CHAIR STETKAR: Well, but I -- you know, if the turbine is going to stop, I don't care what stops the turbine.

MR. STUBBS: Correct, okay.

CHAIR STETKAR: You want to ask your question now?

MEMBER REMPE: Well, maybe we've gone through it, and I just -- but again, just to make sure I understand.

But basically, during the discussions earlier this morning, they talked about, did they do an analysis -- or John asked, did they do an analysis to demonstrate it would last for the full hour?

And I was curious on, did they submit it

to NRC, and was it reviewed, and they said they didn't.

MR. STUBBS: Okay.

MEMBER REMPE: Is that true and --

MR. STUBBS: Well, what are you asking? Would what last?

MEMBER REMPE: Yes, the EFWS --

CHAIR STETKAR: The heating and cooling.

MEMBER REMPE: Yes.

MEMBER SHACK: The heat-up analysis, that shows it lasts at least an hour.

MR. STUBBS: Well, they didn't present analysis to me, but this would be part of the environmental qualification of the equipment, and my understanding is that the room temperatures do not exceed the 50 degrees C within one hour, and the equipment isn't environmentally qualified for up to that temperature.

MHI could probably --

CHAIR STETKAR: Well, the question is, have they done an analysis to confirm that in deed, room temperatures will not exceed 50 degrees C --

MR. STUBBS: Okay, I see what you're asking.

CHAIR STETKAR: -- within that one hour

period?

MEMBER REMPE: And I think they said they had.

CHAIR STETKAR: I think they said they had.

MEMBER REMPE: Right, and so, I was just curious, did they submit it to NRC and did you review it and how much depth --

MR. STUBBS: If they submitted it to NRC, I don't think it would be our review. It would be who is looking at the environmental qualification and the envelope for that, and you would have to ask them if they submitted it to the NRC.

MEMBER REMPE: They said they hadn't, so, I guess just is going to --

CHAIR STETKAR: We should follow up --

MR. HAMZEHEE: I think, John, they said they have confirmed the room heat-up calculation for up to one hour, but I don't believe they said whether or not they submitted it to the NRC.

MR. CIOCCO: I thought they had said they had not, and I was just curious on why.

CHAIR STETKAR: Well, we can ask. MHI, have -- have you submitted that room turbine driven emergency feedwater pump room heat-up calculation to

the staff, to confirm that in deed, the available time window to restore ac power is, in deed, at least one hour, and not something shorter?

MS. BERRIOS: I think it will have to be an outage.

CHAIR STETKAR: I just want to see if the --

MR. HAMAMOTO: This is Hiroshi. Chapter 19 this includes temperature evaluations, calculation based on that.

(Off the record comments)

CHAIR STETKAR: And you said that is in Chapter 19?

MR. HAMAMOTO: Chapter 19, RAI response include such a temperature evaluation.

CHAIR STETKAR: Okay, that would support the PRA.

MEMBER REMPE: Okay.

CHAIR STETKAR: So, let's put it down. We'll track it, to make sure that we -- it's not a separate question, it's just a tickler that when we get to Chapter 19, to remember that we have confidence in that.

Okay, the only other question that I had is -- and this is not emergency feedwater. So, does

anybody else have anything to do, any other questions or issues with emergency feedwater?

Okay, I had only one other question. There is -- well, a question and a comment, and this is a comment. I'm hoping that somebody catches it, but if you don't, I need to find the -- let me find the section.

This is the bad thing about keeping too many notes, because one cannot find.

There is a discussion -- okay, in Section 10.3.4.1 of the SER, there is a discussion about the ability to cool-down using the main steam de-pressurization valves, the MSDV's, and there is a statement in there saying, "The valves are designed such that they're capable of cooling at a rate of 10 degrees C (50 degrees F) per hour, and controlled from the main control room."

A cool-down rate of 10 degrees C an hour is not 50 degrees F per hour. Ten degrees C in absolute temperature is 50 degrees Fahrenheit, about, but a cool-down rate of 10 degrees C per hour is about 18 degrees Fahrenheit per hour.

So, I'm hoping that they can cool-down in deed, at 50 degrees Fahrenheit per hour, which is about 28 degrees C per hour, but you may want to just

correct that, and confirm that, in deed, they can cool-down at 50 degrees Fahrenheit per hour.

MR. KIPPER: This is Scott Kipper, from this morning.

The 50 degrees F is what is listed in the DCD.

CHAIR STETKAR: Yes.

MR. KIPPER: We did notice that just in the SER.

CHAIR STETKAR: Yes, yes, I noticed the DCD does consistently -- and I even think I found 28 degrees C somewhere in the DCD, but just for sort of the staff completeness, so, there is no confusion.

Now, one question I did have is, for the main steam system and the main condensate and feedwater system, there are tables that present the results of the failure modes and effects analysis, for both of those systems.

In particular, in those failure modes and effects analysis, there are analyses done of the main steam isolation valves and the main feedwater isolation valves.

The failures that are evaluated in those FMEA's are limited to only failures of the individual solenoids that actuate those valves.

The argument is made that no single failure of an individual solenoid will cause the resulting valve in the feedwater isolation valve or the steam isolation valve, to fail.

My question is, is that an adequate failure modes and effects analysis, to demonstrate that in deed, the main steam isolation and main feedwater isolation functions are achieved with a single failure?

For example, if the main steam isolation valve did not close, despite the fact that the solenoids worked okay, or the main feedwater isolation valve, the assertion is that they satisfy the single failure criterion.

This again, is -- as Hossein dutifully reminded me, perhaps, an issue of interpretation of the requirements versus a technical interpretation, but I'm very interested in that, not so much, by the way, for the main steam isolation valves, because this design includes not only the main steam isolation valve, but a main steam check valve, and you know, each line as a main steam isolation valve and a check valve.

So, it's pretty difficult to see how even failure of a main steam isolation valve itself would

cause any problems.

I'm a bit more curious about what would happen if a main feedwater isolation valve failed to close on a main feedwater line break between the steam generator and the feedwater isolation valve, because the main feedwater system would tend to feed that break.

If it's inside the containment, you're pumping a lot of energy inside the containment, and I don't know whether -- we haven't looked at Chapter 15, for their analysis, and I don't know what assumptions are made regarding timing or success of the isolation of the feedwater break.

So, I was curious whether first of all, the staff has a rationale for accepting this notion of only looking at the solenoid actuators and not the valve itself, and if so, what is the rationale for that, and if you have thought about failure of the main isolation valve failing to close, whether that's consistent with, in particular for the feedwater break analysis in Chapter 15, in terms of the amount of -- the time and the amount of energy that's delivered into the containment on that break.

I suspect there isn't an answer to that, today, but I'd like to get it out on the table. If

you do have any feedback, you know, I'd appreciate it, but if not, we'll just keep that as something for a later time.

MR. REDDY: Mr. Stetkar, I am Devender Reddy, again.

Like you said, in Chapter 15, those analysis, of course, are performed by the group -- branch. So, we'll get back to you on that issue.

CHAIR STETKAR: Yes, I mean, I don't know what -- we haven't seen 15. I didn't have the time to go back and try to find it, and look at the assumptions.

MR. REDDY: Okay, sure.

CHAIR STETKAR: So, thanks.

MR. REDDY: We coordinate with Chapter 15 on some issues, so, this, we will check and we will let you know.

CHAIR STETKAR: Okay, thank you.

MR. REDDY: Thank you.

CHAIR STETKAR: The reason I bring it up, by the way, is some currently operating plants have had to take credit for closure of the main feedwater control valves and bypass valves, to satisfy timing, and there has been questions about whether they should be categorized as safety related pieces of equipment,

and on this plant, they are not.

MR. HAMZEHEE: I think usually, if they do that in Chapter 15, usually, they are safety related, and they have to have some control. They can't just take credit for it.

CHAIR STETKAR: Yes, that's right, that's right, and as I said, there may be a hook to 15 that will solve that question.

With that, do any of the other Committee members have any questions for the staff?

Good, thank you very much for coming back from lunch and sitting through this. I really appreciate it, and with that, I guess we'll turn to --

MR. KIPPER: I'm sorry, I just had one more clarification from this morning that I wanted to make.

We had mentioned that the final evaluation for flow accelerated corrosion would be performed by the COL Applicant. That is incorrect. That would be performed by MHI.

CHAIR STETKAR: As part of the DCD?

MR. KIPPER: As part of the DCD, yes.

CHAIR STETKAR: Good, I'm glad to hear that. That means we will, in deed, in principle, have a chance to look at that. Thank you.

With that, I guess we'll hear from -- is there anything else? Yes, Ryan?

MR. SPRENGEL: One more thing, well, maybe two, while I've got a captive audience, I guess.

But we mentioned about showing the comparison for the secondary water chemistry.

CHAIR STETKAR: Yes.

MR. SPRENGEL: We don't have it electronically, and so, I think we'll go ahead and save that as part of our response that we submit to you, following the meeting.

CHAIR STETKAR: Yes, I think that's fine, and -- great, thanks.

MR. SPRENGEL: And then one of the other questions that I captured that we'll answer is on the effects of the four -- all four -- yes, the steam bypass valves opening.

CHAIR STETKAR: Basically, what is it, have the effects from a bank -- you know, I don't know how they're arranged.

There are four banks and there are 15 valves. So, I don't know how they are grouped, but it's one bank of valves sticking fully open. I don't know whether that is --

MR. SPRENGEL: Okay.

CHAIR STETKAR: I'm assuming one bank --

MR. SPRENGEL: Okay.

CHAIR STETKAR: One of those four banks must have four valves in it.

MR. SPRENGEL: Right.

CHAIR STETKAR: So, pick the bank, that has four.

MR. SPRENGEL: I'll give a small clarification that they have -- or we have analyzed in Chapter 15, one valve.

CHAIR STETKAR: That's a standard?

MR. SPRENGEL: Right, and so, and we have the control system in place, knocks off four.

So, we will -- I guess the clarification will be, why we don't analyze all four, not what analyze was done.

CHAIR STETKAR: Okay, if you can justify why you don't analyze all four, that's fine.

MR. SPRENGEL: Okay.

CHAIR STETKAR: It really gets into what is the cool-down and de-pressurization rate of a bank of four valves sticking open -- you know, one valve sticking open is rather innocuous.

MR. SPRENGEL: Right, it's like a low --

CHAIR STETKAR: Yes, four valves sticking

open is more interesting. That's 15 to 17 or 18 percent. What is the cool-down rate and de-pressurization rate for that transient compared to a full -- you know, the design basis steam line break event, and what is the relative time, if you -- you know, A) do you get a signal to close the MSIV's?

If you do, when does that occur, and what happens in the interim, in terms of automatic system responses, you know, pressure temperature responses?

MR. SPRENGEL: Okay.

CHAIR STETKAR: So, if you have something to kind of justify the fact that that single bank effect is bounded in some way, by the steam line break analysis, that is fine. That is basically all I was looking for.

MR. SPRENGEL: Okay, thank you.

CHAIR STETKAR: Thanks. Anything else? Good, thank you. Turn the floor over to Luminant.

MR. MONARQUE: John, do you want me to go ahead?

CHAIR STETKAR: Steve, yes, if you --

MR. MONARQUE: Okay, I'm ready to go ahead and get started.

CHAIR STETKAR: Okay.

MR. MONARQUE: Steve Monarque. I'm ready

to go ahead with my opening remarks.

(Off the record comments)

MR. MONARQUE: All right, good afternoon. My name is Steve Monarque. I'm the lead project manager for the Comanche Peak application.

Thank you for giving us the opportunity today, to present our two chapters, Chapter 8 and 10 of the application.

This is our second meeting before the ACRS Subcommittee. As you are aware, we presented Chapter 5 several months ago, and with that, I'll reintroduce my Branch Chief and I'll go into details of our staff's review after Luminant has concluded their presentation. Thank you.

CHAIR STETKAR: Great, thanks a lot, Steve. It is all your's.

MR. WOODLAN: Okay, good afternoon. Pleasure to be back here again. I am Don Woodlan. I am the manager of regulatory affairs for Luminant in the new-build area.

As Steve mentioned, this is our second briefing. We're glad to be here and be able to do it.

Let me briefly introduce some of the people that we have here today.

To my immediate right is Tim Clouser. He

is on our new-build staff. He is -- are you still licensed?

MR. CLOUSER: I am no longer licensed.

MR. WOODLAN: No longer licensed. Formerly licensed operator, has a lot of experience in the plant, especially in the chemistry area, in case we have some questions in that arena.

Next to him is Joe Tapia. Joe is with MNES and they are our prime contractors in the development of the COLA. So, they play a big role in what we have here today.

To my left is John Conly and Todd Evans. They're going to be our presenters. I'll let them introduce themselves when they actually begin the presentations.

Just to -- a brief summary, so, that everybody is up to speed.

We did file our COLA application back in September 2008. We filed at revision to that, Revision 1, in November 2009, and the latest revision is Revision 2, which was filed in June of this year.

So, that is our current status, and with that, I think we're ready to start Chapter 10, John.

MR. CONLY: Thank you. Good afternoon. My name is John Conly. I am the COLA project manager

in the Luminant licensing department of the new-build project.

It's my pleasure to present to you FSAR Chapter 10.

The agenda, or the order of presentation will have a brief introduction. I'll go through sub-section by sub-section discussion, looking at COLA items, departures, briefing the SER summary and also, addressing site specific aspects and then we'll summarize the whole presentation.

As far as the introduction goes, the Comanche Peak Units 3 and 4 final safety analysis report, or FSAR, uses the incorporated-by-reference methodology. We have taken no departures from the US-APWR design control document.

There are no SER open or confirmatory items for FSAR Chapter 10.

We have one proposed license condition in Chapter 10, and we have no contentions currently pending before the ASLB.

We have four sub-sections in Chapter 10. The first one is 10.1, title summary description.

Again, the FSAR incorporates by reference, the DCD without departures or supplements in this sub-section, and there are no COL information items.

Regarding any NRC SER, there are no open items or confirmatory items and there are no proposed license conditions in 10.1.

Section 10.2 describes the turbine generator. The FSAR incorporates by reference, the DCD without any departures. There is one COL information item, which is addressed in the FSAR.

Regarding the NRC SER, there are no open items and no confirmatory items. There is one proposed license condition regarding the turbine generator inspection program, which will be established and implemented prior to fuel load.

MEMBER SHACK: Just out of curiosity, do you have a solid core, or a solid rotor in your current turbines that you inspect?

MR. WOODLAN: Yes, we were asking ourselves that same question, when we were sitting over there.

I believe we started out with hollow core.

MEMBER SHACK: Okay, so, you have --

MR. WOODLAN: But we've changed out all of the rotors over the years, and I had not kept up, so, I don't know the answer.

MR. CONLY: Sub-Section 10.3 is the main steam supply system. Again, the FSAR incorporates by

reference, the DCD without departures.

There are two COL information items, both of which are addressed. The NRC SER has no open items or confirmatory items, and there are no proposed license conditions in 10.3.

CHAIR STETKAR: John, a question on 10.3, and this might just be my own lack of knowledge about terminology.

But when you discuss the flow accelerated corrosion monitoring program, consistently in the FSAR, you use the term high energy systems.

I'll read you a quote, the first one, "The FAC monitoring program analyzes, inspects, monitors in trends, FAC degradation of carbon seal piping and piping components in high energy systems that carry water or wet steam and are susceptible to erosion and corrosion damage."

Read literally, in terms of what we understand to be high energy systems, that would seem to exclude applying that program to condensate systems and heater drains and those types of systems, that are not typically characterized as high energy systems.

Is it your intent to restrict your flow accelerated corrosion monitoring program to only systems that are classified as high energy piping?

MR. CONLY: Not to my knowledge, but I will get back with you on that, because the --

CHAIR STETKAR: After that, because it wasn't -- I ran across it the first time, and I thought, okay, well, this is just you know, a vernacular typo.

But it's consistent, every time it talks about the system. It's always characterized as high energy piping, or high energy systems.

The curiosity was, is there some sort of subtle distinction being made there, or is it just simply -- you know --

MR. CONLY: I don't believe we're being subtle.

CHAIR STETKAR: Okay.

MR. CONLY: No.

MR. WOODLAN: It could be just a terminology thing.

CHAIR STETKAR: But you understand the concern?

MR. WOODLAN: Yes.

CHAIR STETKAR: Because you know, would you say -- you could claim that well, we only need to do it now on our, you know, high energy portions of our feedwater system and main steam piping systems.

MR. WOODLAN: We wrote those words -- we went back to our Unit 1 and Unit 2. We looked at their programs, which are based on the industry -- the guidance provided by the NRC and the industry guidance, and maybe they're using those words with a different definition and we --

CHAIR STETKAR: That may be true, because you know, we don't know the answer.

MR. WOODLAN: We'll follow up on that.

MEMBER SHACK: It claims consistency with the NSAC.

CHAIR STETKAR: Right.

MR. WOODLAN: Yes.

CHAIR STETKAR: Yes.

MEMBER SHACK: All right.

CHAIR STETKAR: Okay, thanks. That is --

MR. WOODLAN: Thank you.

CHAIR STETKAR: Just a terminology point.

MR. CONLY: And speaking of the flow accelerated corrosion monitoring program.

The program addresses Generic Letter 89-08, and it is consistent with the industry guidance in NSAC-202-L. The program will be established before fuel load, with a governing procedure and several implementing procedures, and the program will be

updated periodically, to include industry experience, as we move forward.

Section 10.4, other features, again, the FSAR incorporates by reference, the DCD without departures. There are four COL information items that are addressed in the FSAR. The NRC SER has no open items or confirmatory items and there are no proposed license conditions.

Regarding site specific aspects, the circulating water system uses cooling towers, forced draft cooling towers for the cooling function. There are four towers, two per unit. Each tower contains 30 cells. So, these are very large forced-draft cooling towers.

Make-up and blow-down for the cooling towers and circ water system is to and from Lake Granbury, approximately seven miles away.

The make-up water intake structure screens limit intake water velocity to half a foot per second. We have two 50 percent make-up pumps per unit, and a common spare installed in the intake structure on Lake Granbury.

Blow-down is by gravity drain, assisted with priming pumps, and the blow-down is treated by filtration, reverse osmosis and evaporation as

necessary, to meet the water permit.

CHAIR STETKAR: John, before you -- I think the next one gets into steam generator blow-down.

MR. CONLY: Yes.

CHAIR STETKAR: A couple of questions about the system, and this is some curiosity.

The certified design has a total of eight circulating water pumps per unit, in two groups of four.

They are characterized as 12 ½ percent pumps. That implies that all eight pumps will be running continuously, at full power operation. Is that your understanding of the design?

MR. CONLY: Yes.

CHAIR STETKAR: You plan to have all eight of them running?

MR. CONLY: Yes.

CHAIR STETKAR: So, if you lose a circ water pump, you may have to reduce power?

MR. CONLY: May have to.

CHAIR STETKAR: Right, depending, I'm assuming, depending on temperatures and all that kind of stuff.

MR. CONLY: Right.

CHAIR STETKAR: Okay, I just wanted to make sure that in deed, all eight of them -- you were planning to have all eight of them running constantly and there wasn't more margin in there.

MEMBER BROWN: Just a curiosity question, if I could ask?

CHAIR STETKAR: Yes, you can.

MEMBER BROWN: Lake Granbury is how big? It's huge, huge, huge?

MR. CLOUSER: We use it --

CHAIR STETKAR: It's not one of the Great Lakes, but it's a pretty big lake.

MR. CLOUSER: It is a dammed river and it's --

MEMBER BROWN: It's a dammed river?

MR. CLOUSER: Right, and it's about 30 miles long.

MEMBER BROWN: Okay, and in the current drought, how low is it?

MR. CLOUSER: It's about four feet low.

MEMBER BROWN: Does that mean anything in terms of volume?

MR. CLOUSER: It means I can't get my boat into the water.

MEMBER BROWN: My question was related to

the current very, very large drought that has been going on, and how low it was. You're telling me it's very, very low, but I guess that even that amount of water drop is not critical to the ability to use it?

MR. EVANS: Right, the suction of the pumps is below the worse case drought scenarios now. We can always create a new worse case.

MEMBER BROWN: Yes, when was the worse case drought and how low was that?

MR. EVANS: It was the 50's. Yes, it was the worse case drought scenario.

MEMBER REMPE: So, if it's four feet low now, how low --

MR. EVANS: Well, the lake didn't exist in the 50's, but you know, we model the conditions of --

MEMBER BROWN: The flow of the river?

MR. EVANS: Yes.

MEMBER BROWN: The river feed to the dam?

MR. EVANS: Right.

MEMBER BROWN: And how far below the initial surface was it -- is the intake right now?

MR. EVANS: I don't know how far, what the depth -- the depth of the pump suctions?

MEMBER BROWN: More than four feet three inches?

MR. EVANS: Oh, no.

MEMBER BROWN: Got to have some humor in there somewhere. I mean, is it 30 feet? Forty feet?

MR. WOODLAN: If you just want an approximation, I believe it's around 15 feet below the normal surface, nominal surface.

MEMBER BROWN: Okay, all right, just trying to get a feel, that is all.

MR. EVANS: It's in a location close to the dam, so, the depth of the water with that is a little bit deeper than other parts of the lake and the river.

MEMBER BROWN: How deep is that lake, the dam area?

MR. WOODLAN: We don't have the precise numbers. It is not a really deep lake. I think --

MEMBER BROWN: About 300 or 400 feet?

MR. WOODLAN: No, it's closer to -- this is around 60 feet, the channel, where the river really was, which is the deepest part, is maybe 60 feet.

MEMBER BROWN: Okay, I am done.

CHAIR STETKAR: We haven't looked at Chapter 9, yet. It will be a while before we get to it.

The make-up water system also provides

make-up to your ultimate heat sink. Do you have a 30-day supply of water in your ultimate heat sink without make-up or what is the capacity of your ultimate heat sink for post-trip decay heat removal of cooling without make-up?

MR. CONLY: It is 30 days.

CHAIR STETKAR: It is 30 days?

MR. CONLY: Yes.

CHAIR STETKAR: Okay, thank you. There are a -- there is a statement in the FSAR, that says, "A reliable electrical power source is provided for the make-up water pumps."

Where are those pumps powered from? Are they just plugged in, out at the -- out at the lakeshore into the local supply, or do you provide power for them, from the plant?

MR. CONLY: I can answer it.

MR. EVANS: It's not provided from the plant, because of the distance. But the plant is to have two diverse transmission lines, you know, distribution lines come in, that would -- in case the loss of one, you could transfer over to the other.

CHAIR STETKAR: I don't know anything about Unit 1 and Unit 2. Do you have a similar type of situation for Unit 1 and Unit 2, or is your cooling

system separate --

MR. EVANS: It's a little bit different because Unit 1 and Unit 2 were -- the plant is actually located on Squaw Creek Reservoir.

CHAIR STETKAR: Yes.

MR. EVANS: It's on reservoir. So, the cooling water for Unit 1 and Unit 2 comes from the local lake next to the plant. That lake is not large enough to handle the cooling capacity for the new units.

CHAIR STETKAR: Okay, I see.

MR. EVANS: So, we have the -- pumping the water directly over from --

CHAIR STETKAR: Okay.

MR. WOODLAN: And it's once-through cooling, not cooling --

MR. EVANS: That is true, it's once-through cooling.

CHAIR STETKAR: It's just once-through cooling to that reservoir?

MR. EVANS: Yes.

MEMBER SHACK: Okay, why do you have the lines to Lake Granbury now?

MR. EVANS: Because the Squaw Creek Reservoir is not on a normal running river. It's an

off-river tributary.

So, we do pump water over from Lake Granbury to Squaw Creek Reservoir to keep it --

MEMBER SHACK: So, actually, you fill your reservoir?

MR. EVANS: That is correct, and also, we keep some water circulating.

CHAIR STETKAR: Okay, that's fine.

MEMBER SHACK: You guys are up on top of a mountain. I was trying to figure out what in the world a lake is doing up there. It's a little -- there you go, it's a mesa, there you go.

CHAIR STETKAR: Anything else from any of the members on circ water systems, circ water make-up? Thanks.

MR. CONLY: As you referred, the steam generator blow-down system is the next site specific aspect.

The first three bullets are not specifically site specific, but they were necessary to let you understand how the system works.

The start-up blow-down rate is approximately three percent of max steaming rate, or about 600,000 pounds per hour.

Normal operation blow-down rate is

approximately one percent, or 200,000 pounds mass per hour, and there is a radiation monitor down stream of the steam generator blow-down heat exchanger, so, that we can be sure that we're not discharging anything incorrectly.

The cool blow-down goes into an on-site existing waste management pond, and we have both single wall stainless and double wall carbon steel piping in various portions of the steam generator blow-down system, to meet the guidance of Reg Guide 4.21.

One of feature of the steam generator blow-down system is, it's used as a mechanism or a method to drain the steam generator in which we use 20 pound nitrogen, forcing the steam generator water out through the steam generator blow-down system, to ease draining.

CHAIR STETKAR: John, before you sort of end, your start-up blow-down flash tank and heat exchanger are a site specific design feature, is that correct?

MR. CONLY: That is correct.

CHAIR STETKAR: And of course, the connection to your -- whatever you call it, the pond.

Is that -- the start-up blow-down flash

tank and heat exchanger common to Units 3 and 4, or do each of the units have a separate --

MR. CONLY: Each unit has a separate --

CHAIR STETKAR: Has a separate --

MR. CONLY: -- start-up blow-down and flash tank and heat exchanger.

CHAIR STETKAR: Just out of curiosity, why do you do that, just to -- you know, the certified design has sort of connections to a different waste system, but you're led to the impression that the normal blow-down flash tank and cooling system can handle the three percent flow.

Do you just do it --

MR. EVANS: You mean why is it not common?

CHAIR STETKAR: No, no, no, not why common -- why do you need a separate blow-down flash tank heat exchanger?

You know, I understand that you have your own way of getting rid of the blow-down water. You don't want process it through your -- you don't want to put it back into the condenser and process it through your start-up -- through your condensate polishers or -- for some reason.

But I was just curious, why you decided to have this change to the certified design.

MR. CONLY: The start-up flash tank is sized for 600,000 pounds mass per hour, as the heat exchanger, start-up heat exchanger has a design heat duty of 112 million BTU per hour.

The normal operating steam generator flash tank has a design flow rate of 202,000 pounds mass per hour, and the combined regenerative and non-regenerative heat exchangers have a total of 42 million BTU per hour.

CHAIR STETKAR: So, you felt you needed the extra capacity just to give you clean up on start-up?

MR. CONLY: Yes, that's correct.

CHAIR STETKAR: A faster clean up on start-up?

MR. CONLY: That is correct.

CHAIR STETKAR: Compared to the design, okay, okay, thanks.

MR. CONLY: In summary then, we have incorporated the DCD by reference in the final safety analysis report, Chapter 10 without any departures.

All COL information items are addressed in Chapter 10. There are no SER open items or confirmatory items and we have only one proposed license condition.

Are there any further questions from the members?

CHAIR STETKAR: Any members have any additional questions? If not, that was good. Thank you. You guys are good. We're ahead of schedule.

All right, it helped. People who have lives can actually return to them some time today.

(Off the record comments)

CHAIR STETKAR: With that, we'll have the staff come up and do the staff on Chapter 10, and then we'll hit Chapter 8.

(Off the record comments)

MR. MONARQUE: Thank you for having us this presentation on Chapter 10. Before we got started, before I turn it over to Paul, I just want to reiterate, the staff's review was based on the Revision 1 of the COL, which incorporated Rev 2 in the DCD.

We did receive Revision 2 of the COL, late at the end of June. However, we're still reviewing changes made to it.

So, our safety evaluation, as described in our safety evaluation of the COL was based on Rev 1.

CHAIR STETKAR: Okay, you make sure you get Rev 2 to -- do you have a full Rev 2 of the COL?

MR. MONARQUE: Yes.

CHAIR STETKAR: FSAR?

MR. MONARQUE: Would you like a copy?

CHAIR STETKAR: We absolutely would.

MR. MONARQUE: How many DVD's do you need?

CHAIR STETKAR: Just talk to Ilka over there.

MR. MONARQUE: Okay.

CHAIR STETKAR: She'll handle it.

(Off the record comments)

CHAIR STETKAR: Paul, let them do whatever they do.

MR. MONARQUE: All right.

MR. KALLAN: All right, in the interest of time, I only have six slides. I'm going to go very fast.

I'll go to slide two, and basically, Steve Monarque is our lead PM and I'm the project manager for Chapter 10 COL.

Does the review team actually -- I'm not a one-man show. Does the whole -- the group is in the audience. So, slide three, that's what the particular review team has.

Slide four is the review, the COLA review and we divided on just -- on the slide, basically

showing you the section, the amount of questions that were for each section, and the number of open items.

So, there is no open items on this slide, and there were a total of eight questions for Chapter 10 COL, and no open items.

The end is my acronyms, and I'm done then.

CHAIR STETKAR: Okay, let's see.

MEMBER BROWN: And we're still behind.

MR. KALLAN: Well, I made up some time today.

MEMBER BROWN: There are some questions about the -- and I guess I should have asked the Applicant about this, but I forgot.

Section 10.4.8.2.1 of the FSAR Rev 1 indicates that the steam generator blow-down containment isolation valves are closed by the following signals, high radiation from the start-up steam generator blow-down water radiation monitor, high water level in the start-up steam generator blow-down flash tank, and high pressure in the start-up steam generator blow-down flash tank.

In deed, I checked Section 10.4.8.4 and confirms that those signals actually do close the main isolation valves.

My question is, since those signals close

containment isolation valves, are those -- are the transmitters and the equipment to develop those signals safety related pieces of equipment?

MR. MAKAR: I'm Greg Makar from the staff, and I did this review, and --

CHAIR STETKAR: Since this is a plant -- you know, this is a site specific addition to the blow-down system, so, it would be under the purview of the Applicant.

MR. MAKAR: And the question was whether those sensors are safety related?

CHAIR STETKAR: That is right.

MR. MAKAR: And I don't know the answer.

CHAIR STETKAR: Could we find it -- the question arises because all of this equipment is outside somewhere, it's not even in the turbine building or anywhere. It's out somewhere in the yard.

MR. MAKAR: Okay.

CHAIR STETKAR: And since it's, you know, performing a initiate-containment isolation function, the question arises, should those initiation signals be safety related? If not, why not?

MR. MAKAR: Yes, I can only say based on --

CHAIR STETKAR: This one is a little more

-- you know, I asked the question earlier about turbine trip, reactor trip things.

MR. MAKAR: Right.

CHAIR STETKAR: This one is even closer to a defense-in-depth isolate containment function.

MR. MAKAR: Well, as I said, I don't know the answer. I know we have some in the Rev 2 of the COLA, I believe there have been some -- or it may be the DCD, there have been some changes to the --

CHAIR STETKAR: Well, this wouldn't be in the DCD.

MR. MAKAR: -- of the actual --

CHAIR STETKAR: Because this is strictly -- this is -- these are strictly signals initiated by that start-up, whatever they call it, the start-up -- additional blow-down --

MR. MAKAR: Blow-down system.

CHAIR STETKAR: -- blow-down system.

MR. MAKAR: Okay.

CHAIR STETKAR: And I know you ask a question about, you know, how would it isolate blow-down and part of the response is that it got filtered into the FSAR, it were to list these signals, and in deed, you know, they don't close any non-safety related valves, as best as I could tell.

I traced it back through and in deed, they go into the safety related, you know, containment isolation, blow-down isolation valves.

So, I guess I'd like some follow up on that one.

MR. MAKAR: Okay.

MR. MONARQUE: And John, you said this is 10.4.8.2.1?

CHAIR STETKAR: I found the listing, yes, it's 10.4 -- it's FSAR Section 10.4.8.2.1 and 10.4.8.4 of the FSAR.

MR. MONARQUE: Ten.4.8.4 and 10.4.8.2?

CHAIR STETKAR: Yes, yes.

MR. MAKAR: It is part of the COL item.

CHAIR STETKAR: And it's Rev 1. So, I don't have Rev 2. I don't know whether any changes have been made in Rev 2 to provide further elaboration or anything.

MR. MONARQUE: We'll follow up.

CHAIR STETKAR: Okay, the reason I asked you instead of them is, as part of this relationship of safety related versus non-safety related interfaces, because I am still not clear on all of that.

Any of the other members have any

questions for the staff?

Well, that was pretty short and relatively easy, and we are pretty much closer to being on time, but still behind.

Let's hear from Luminant on Chapter 8, and I'm just thinking about when best to take a break. It's still a little early for a break.

(Off the record comments)

MEMBER BROWN: Did we do the DCD on this Chapter?

CHAIR STETKAR: Say what?

MEMBER BROWN: The DCD on this chapter?

CHAIR STETKAR: We have, we have gone through the DCD on Chapter 8, yes.

MEMBER BROWN: Totally forgot.

CHAIR STETKAR: It was a while ago, don't hold me to the date, but yes, we've -- it was one of the first ones that we actually looked at.

MEMBER BROWN: Okay.

CHAIR STETKAR: That is why I didn't ask a lot of the questions for the AAC, gas turbine, all that sort of stuff. We actually had been through that.

The only reason I raised questions about the turbine driven emergency feedwater pump is, I

didn't know how that system designed to work, so, I was only thinking about electric power, ac electric power supplies, in terms of the --

MEMBER BROWN: Yes, and that was -- just after - I went back and forth and refreshed my mind again, and the Fukushima total loss of all ac, how does that apply to the alternate ac sources, which were wiped out, as well?

CHAIR STETKAR: Yes, you know, it is --

MEMBER BROWN: It's just an hour.

CHAIR STETKAR: Yes, I mean, it's pretty obvious, I don't think --

MEMBER BROWN: How do we deal with that?

CHAIR STETKAR: How we deal with that is not something that we're going to solve, or should address, I don't think, at this point, because --

MEMBER BROWN: I tend to agree with you.

CHAIR STETKAR: -- we have no idea, you know, what the recommendations are going to be, what the Commissions' decision is going to be, regarding recommendations, how they may apply to the new plants versus existing fleet.

So, I think that in the sense of anything that you may have heard, in terms of Fukushima lessons learned specific recommendations, at the moment,

unfortunately, that is kind of beyond what we can directly address.

I mean, we may hear -- some time in the future, we may hear back from the staff and the Applicant on potential changes to designs or something like that, but at least we should certainly understand, you know, how the current proposed design is going to work and you know, what the specific features of that design are.

(Off the record comments)

CHAIR STETKAR: Okay, I'll have John, Don, whoever.

MR. WOODLAN: Let me address a little bit about the isolation valves for the blow-down tank.

CHAIR STETKAR: Yes.

MR. WOODLAN: I think it says in the DCD that you do have these signals, such as the pressure in the tank, or the water level in the tank, but it also says that there is a separate containment isolation signal for those valves.

So, that is the safety related closure, is the --

CHAIR STETKAR: Oh, does it?

MR. WOODLAN: -- containment isolation signal, that is in the DCD.

CHAIR STETKAR: Is it in -- oh, in the DCD?

MR. WOODLAN: Yes.

MR. CLOUSER: It doesn't appear to be in the FSAR, but it is in the DCD.

CHAIR STETKAR: Okay, all right.

MR. WOODLAN: And you know how it is when you --

CHAIR STETKAR: Well, okay.

MR. WOODLAN: When you have words, you have to look at the way it's --

CHAIR STETKAR: Yes, I was going to say, for clarification, I thought that I went back and looked at that, and it wasn't clear to me, because the DCD says that the --

MR. WOODLAN: I have a copy, and I'll be happy to let you have it, and we'll get the --

CHAIR STETKAR: I've got the DCD. I have to go back and look at that.

You know, I know those valves go closed on a containment isolation signal.

MR. WOODLAN: Right.

CHAIR STETKAR: You know, which is different.

MR. WOODLAN: Well, that is a safety

related function.

CHAIR STETKAR: That is right, and that is -- if that is the only safety related function, that you're taking credit for, then I understand that.

MR. WOODLAN: Right.

CHAIR STETKAR: So, that is basically your position, although those valves --

MR. MINAMI: Yes.

CHAIR STETKAR: -- the safety related containment isolation valves do receive signals to close from the start-up blow-down flash tank, whatever those functions are.

MR. WOODLAN: Exactly.

CHAIR STETKAR: You're not taking credit for those signals in any of your safety analyses?

MR. WOODLAN: That is correct.

CHAIR STETKAR: Okay, okay, thanks.

MR. MONARQUE: Did that answer the --

CHAIR STETKAR: Yes, that is the -- I understand that, as long as the safety analyses don't take credit for those signals somehow.

MR. MONARQUE: Our action is -- it's now removed?

CHAIR STETKAR: That is correct.

MR. MONARQUE: Okay, all right.

CHAIR STETKAR: I am happy with that.

MR. MONARQUE: Thank you.

CHAIR STETKAR: I mean, I can live with that.

MR. EVANS: Okay, as introduced earlier, I am Todd Evans. I am the manager of engineering projects and operating system for our Luminant new-build team at Comanche Peak.

I've been involved in electrical systems at Comanche Peak for longer than I care to mention.

So, today, I am here to present the FSAR Chapter 8 for the R-COLA.

Similar what John did in his presentation for Chapter 10, we're going to go through the various sub-sections of the R-COLA Chapter 8. We're going to look at site specific designs, COL items, departures, open items, confirmatory items and proposed license conditions, and then summarize everything at the end.

The R-COLA is authored using incorporate-by-reference methodology. The Chapter 8 takes -- R-COLA Chapter 8 takes no departures from the DCD. All site specific SER open items have been addressed, and all site specific confirmatory items have been addressed and have been included in FSAR Revision 2, which was submitted in June.

Although, Revision 3 is scheduled fo June 2012, so, if we have any additional items to roll up from additional RAI's, or the open items that we have now, those should occur next June.

As John mentioned, we have no contentions remaining for the ASLB.

Sub-Section 8.1 is the introduction to the electrical system, and for Section 8.1 is it incorporated by reference philosophy. There are no departures or supplements in Section 8.1. There are no COL information items in Section 8.1.

There is one site specific safety evaluation report open item number 8.1-1, related to the effects of shared electrical equipment between plants on safe shut-down, and I am going to talk about that in a little more detail on the next slide.

There is no confirmatory items and no proposed license conditions for this section.

Speaking of the open item 8.1-1, it's in regard to the Comanche Peak switching station, which does feed both Unit 3 and Unit 4, at the site.

We've been requested by the staff to confirm that this configuration will not impair the off-site power system from performing during an accident in one unit, and shut down -- ability to shut

down and cool down the remaining unit.

MEMBER BROWN: For the uninitiated, like myself, okay, this is -- if all I had to go by was looking at the diagram in Chapter 8 --

MR. EVANS: Right.

MEMBER BROWN: -- when you say switching unit?

MR. EVANS: Yes, when I get to the next slide, I've got a little simplified diagram.

MEMBER BROWN: That works for me.

MR. EVANS: And maybe, yes, the terminology is a little confusing.

MEMBER BROWN: Okay, I'm just -- here is the shared --

MR. EVANS: Right.

MEMBER BROWN: I mean, this is the Comanche. I presume this is for -- this is for each plant, or is this for both plants at Comanche Peak?

MR. EVANS: That is for each.

MEMBER BROWN: For each?

MR. EVANS: Some of it, yes.

MEMBER BROWN: All right, okay, two different switch yards, is all I'm saying, one for Comanche Peak 3 and one for --

MR. EVANS: Well, let me go to the next

slide.

CHAIR STETKAR: It gets a little more confusing.

MR. EVANS: Yes.

CHAIR STETKAR: As long as you guys keep the terms plant and unit consistent.

MEMBER BROWN: Yes, thank you, I wanted to -- I'm thinking units, you know, 3 and 4, what -- does one of these go with 3 and one of them goes with 4?

MR. EVANS: Let me go to the next slide and go through that, and I think --

MEMBER BROWN: Okay.

MR. EVANS: Okay, well, I've got actually two slides, okay. I'll jump to that, I'm sorry.

Okay, and I am going to try to use the pointer here, to help, if it works. It worked earlier. There is it, I'll try to use that to help point to where I'm talking about, on this slide.

Okay, this figure depicts the site specific aspects of the off-site power system. In the upper right-hand part of the figure, in this box, here, is what we refer to as the Comanche Peak 3 and 4 switching station.

The switching station is 345 kV voltage. It's located on site property, on the Comanche Peak

site property, and it has four transmission lines coming from the grid.

So, you can see there is one there, to the left of the box, and then there is three transmission lines indicated on the right-hand side of the switching station box.

MEMBER BROWN: The boxes are circuit breakers?

MR. EVANS: The small boxes?

MEMBER BROWN: Yes, the small boxes.

MR. EVANS: Yes, those are circuit breakers, yes.

MEMBER BROWN: Okay, so, the feed from the Johnson SW switch yard, or switch --

MR. EVANS: Johnson Switch.

MEMBER BROWN: Okay, or Whitney or whatever, those are 345 kV lines?

MR. EVANS: That is correct.

MEMBER BROWN: All of them.

MR. EVANS: So, there is four 345 kV lines coming into the switching station, and the switching station employs what is known as a breaker and a half scheme. You see the three breakers between the two buses, which is commonly referred to as a breaker and a half scheme.

Coming out of the switching station, towards the units, you see the alternate preferred power system and normal preferred power system on this graph, goes to -- I keep losing the arrow, those two are for Unit 3 and then this one and this one, over here, would be the alternate in normal preferred power system feeds for Unit 4.

The distance from the switching station to the switch yards, which I'll get to, that is these other boxes down here, referred to the switch yards, is about a half-mile, give or take a little bit, some are a little longer and some are a little shorter.

So, these are very short transmission lines, these normal and alternate preferred power system transmission lines.

MEMBER BROWN: About how long, you say?

MR. EVANS: About a half-mile, ranging maybe from three-tenths of a mile to six or seven-tenths of a mile, depending on which ones you are talking about.

Okay, then the -- what we refer to as the switch yards. There is a switch yard for each unit.

So, where I'm pointing with the arrow here, that switch yard is the Unit 3 switch yard, and each switch yard consists of main transformers, unit

auxiliary transformers, reserve auxiliary transformers, main transformer breaker and reserve auxiliary transformer breakers, which are -- those breakers, of course, would be at 345 kV.

The configuration of the main transformers, reserve auxiliary transformer and unit auxiliary transformers is standard plant design. So, that is not unique or site specific.

Each reserve auxiliary transformer is connected to the normal preferred power system, through the high voltage circuit breaker.

So, for example, you see the normal preferred power system line coming out of the switching station, comes down into the switch yard and splits and goes through two, what are referred to as the reserve auxiliary transformer breakers, and then feeds the four reserve auxiliary transformers.

Likewise, the alternate preferred power system coming out of the switching station goes down and feeds through the main transformer 345 kV circuit breaker, into the bank of main transformers.

Then on the secondary side of that, you have the generator, load break switch and the generator and then the unit auxiliary transformer.

The reserve auxiliary transformers

normally feed the safety related buses. So, these RAT's, reserve auxiliary transformers normally feed the safety related buses and the unit auxiliary transformers normally feed the non-safety related buses and what is referred to as the preferred buses.

From this point on, you know, beyond this drawing, into the plant, is still -- the off-site power system goes on into the plant beyond this figure, but that is all standard plant design and there is no site specific aspects after that point.

Are there any questions? Did I --

MEMBER BROWN: No, that was a good explanation. Again, point of information for me, since I've only seen one or two of these, and I'm not sure I've grappled all of them yet.

The normal power generation feature for these plants goes out through the alternate power system and when it's feeding the grid?

MR. EVANS: That is correct.

MEMBER BROWN: And then you use what is called -- it's totally opposite from the way I used to work in the program I used to be in.

So, the normal then, is that is -- all of that is fed, off the grid, whether it be -- regardless of where the power comes from, whether it's from your

own generator or whether it's all -- it's just out there, power on the grid, whatever the representation of the power factors and other things allow the --

MR. EVANS: Yes, the electrical flow --

MEMBER BROWN: -- the real power to flow --

MR. EVANS: That is correct.

MEMBER BROWN: -- the way it wants to flow.

MR. EVANS: That is correct.

MEMBER BROWN: Okay, how big is the switching station?

MR. EVANS: Physically?

MEMBER BROWN: Yes. Acreage? Square footage? Square miles?

MR. EVANS: No, no, no, it's, I don't know, a couple of -- maybe 50 or 60 feet wide by several hundred feet long.

MEMBER BROWN: So, it's not segregated --

CHAIR STETKAR: It's got the 300-foot stretch in it where the tie lines go across.

MR. EVANS: I'm sorry, did you say switching station or switch yard?

MEMBER BROWN: Switching station.

MR. EVANS: Okay, I got mixed up there.

The switching station, yes, it would be a little bit bigger than that, on the order of several acres, five or six acres, something like that.

MEMBER BROWN: Okay, so, there is enough segregation between these two E and W, which appear to be fairly main bus type things?

MR. EVANS: Yes.

MEMBER BROWN: Such that --

MR. EVANS: Such that?

MEMBER BROWN: I'm just thinking about the ability to take both of them out with an environmental thing, tornadoes or fire or --

MR. EVANS: Right, that is the -- you have an east and west buses, it's what the E and W stands for, and it does meet the requirements of general design criteria 17.

So, it is designed for certain environmental factors and things like that. For example, the transmission lines, failure of a transmission tower or something like that, would not take out a second line.

MEMBER BROWN: So, if they fall over, they're not going to hit anything?

MR. EVANS: Right, they are not going to hit anything.

MEMBER BROWN: Other than the stuff that is connected to them, would come down to the ground?

MR. EVANS: Right.

MEMBER BROWN: Which will cause certain things to happen.

MR. EVANS: Right.

MEMBER SHACK: How physically separated are the transmission lines? I mean, do they go out off in different directions, or are they really on a common pathway for some distance, before they go out --

MR. EVANS: Here is a picture, here.

CHAIR STETKAR: You need one of these, Bill.

MR. EVANS: Obviously, they come together after the switching station.

MEMBER SHACK: Right.

MR. EVANS: There is --

MEMBER SHACK: But how long do they stay together?

MR. EVANS: These, fairly rapidly go off in different directions, from the switching station.

MEMBER SHACK: But was that in the FSAR or not?

CHAIR STETKAR: The drawing without the

color is in the FSAR.

MEMBER SHACK: Okay.

CHAIR STETKAR: You need a couple of colored pens and a little bit of time to look at it, and it's --

MEMBER SHACK: I must have been falling asleep.

CHAIR STETKAR: It's actually a geographically correct representation, if you look at the -- it gives you an idea of the diversity of directions, and also, what lines -- it actually also shows you the tower lines that -- come on, you're the staff. You guys had one of these. Here, you can look at this one.

Charles, I'm sorry. Charlie, are you okay? You guys can look at that one.

MEMBER BROWN: No, I got what I wanted out of this, it's just the other question was the lines coming in, and Bill asked that question.

CHAIR STETKAR: I do have a number of questions. So, and I don't quite know how to organize them. So, I'll just go through them in chronological order, as they're listed here.

The statement -- and I'm always interested in -- I mean, if this was a single unit and it's --

you had your switch yard here with four lines coming in, breaker and a half, you know, I'd be a happy camper.

Since this is shared between two units, I'm a little more interested in some questions.

There is a statement in the -- and if Charlie could keep his whispering down, it would help.

There is a statement that says -- it's worded a bit strange, but it says, "Both of any two outgoing transmission lines between the plant switching station and the remote off-site switching stations adequately maintain the voltage within plus or minus five percent of 345 kV at the high voltage sides of the main transformers and RAT's while supplying full auxiliary loads of both units under all normal, abnormal and postulated accident conditions."

That seems to tell me that to supply all loads for both units, I need any two out of the four --

MR. EVANS: Transmission lines.

CHAIR STETKAR: -- transmission -- Johnson, Whitney, Parker, deCordova lines.

MEMBER BROWN: Except for the combinations of --

CHAIR STETKAR: Well, except for two

combinations that are not considered independent, and I'll get to that later.

What happens if you only have one 345 kV line available? A plant in Alabama just recently had a tornado go through that wiped out, for example, I think it was five 500 kV lines and one of their two 161 kV lines that left, you know, a couple of units, if not three, with one transmission line to the outside world available.

What happens to you if you only have one transmission line available? Can you support --

MR. EVANS: To my knowledge, we haven't analyzed that particular scenario. We analyzed down to the two transmission lines, and at two transmission lines, it would be sufficient to -- as you read through there.

So, I don't believe we've analyzed for one transmission line.

MR. WOODLAN: I think you know, of course, that would put us in a tech spec, for only having one source of off-site power --

CHAIR STETKAR: Tech specs, I'm not interested in, if a tornado goes through.

MR. WOODLAN: Right.

CHAIR STETKAR: You know, I can fill out

the paperwork later.

MR. WOODLAN: Understand.

CHAIR STETKAR: I'm sort of interested in what happens electrically in the plant, if you get into an extreme condition, you know, a tornado -- hurricanes are probably pretty far north, but tornados do go through there occasionally.

So, I'm just curious whether you've thought about, you know, whether both units would then require gas turbine power?

MR. EVANS: Well, ultimately for a tornado that goes through, if a tornado were to go right through the switch yard --

CHAIR STETKAR: Yes, I'm not talking about a tornado taking out the switch yard. I'm trying to give you one line left, but understand, I'm trying to understand whether or not -- what capability you have for those two units, if you do only have one transmission line?

MR. EVANS: And I don't know. We haven't analyzed, I don't think, for one. We didn't have the analysis done for one single transmission line, and it could be different, depending on which transmission line it is and where it's coming from and the condition of the grid, that has caused the loss,

whether three other transmission lines --

CHAIR STETKAR: And the basic question is, you know, do you -- can you support enough minimum safe shut-down cooling loads on each of the units, with only one transmission line left?

MR. EVANS: Yes, and you know, we haven't analyzed for that condition.

MR. WOODLAN: I think the -- I think you're probably aware of the degraded voltage protection that's provided. It's in the DCD, it's standard plant, and I think what you're getting into is a scenario where there might not be sufficient voltage to support the units, and the degraded voltage would pick that up and would separate the plant from the off-site power.

CHAIR STETKAR: Well, yes, I mean, part of it is degraded voltage.

MR. WOODLAN: Right.

CHAIR STETKAR: And you know, if that is the design, that is the design.

MR. WOODLAN: Yes.

CHAIR STETKAR: I am just trying to figure out whether or not you would actually -- whether you would actually get into that condition or if, in deed, you wouldn't.

MR. WOODLAN: We have emergency operating procedures and I don't know exactly what they recall, in this situation.

But certainly, the operator would have the option that if he detects, from his indicators, that sufficient power is not there to operate the equipment, doesn't have to wait for the automatic system.

He can separate and go onto the emergency generation. Do you recall the procedures?

MR. CLOUSER: Are you assuming the units are tripped, if they're -- if the units are online, they're going to keep the bus voltage up on the -- in the switch yard, so, it shouldn't be an issue.

CHAIR STETKAR: It's probably likely that the units would be tripped in this condition.

MR. CLOUSER: Okay, and then --

CHAIR STETKAR: So, I'm actually concerned -- my question is, can a single transmission line, through an intact switch yard, support post-trip cooling loads on both units?

It most likely can support it on one unit, but can you do it on both units?

MR. EVANS: Yes, it's possible, like I said, we haven't analyzed it, but you know, if you

think of the transmission lines, they are sized to handle 1,500 or 2,000 megawatts worth of power and what we're talking about is for the safety related loads, if you just -- if you limited it to the safety related loads, the emergency diesel generator -- I keep saying diesel -- gas turbine generator --

CHAIR STETKAR: Gas turbine.

MR. EVANS: I'm still on diesels, yes, are 4,500 megawatts each.

CHAIR STETKAR: Yes.

MR. EVANS: So, 9,000 megawatts -- or nine megawatts as compared to 1,000, 1,500, 2,000 megawatts, you know --

CHAIR STETKAR: Well, I have a question, if you haven't done the analysis, you don't know whether a single --

MR. EVANS: That is right, because it depends on the grid situation and what the assumptions are in the grid and whether the grid could support the power flow.

CHAIR STETKAR: Okay, I'll wait for the -- we'll get into the plant later. Bear with me for a moment.

MR. EVANS: Sure.

CHAIR STETKAR: My eyes don't work really

well. In the -- make sure I keep the terminology correct.

Out in the switching station, there are two control houses, and there is some discussion about the control houses and what they control.

It is noted that the two normal preferred power system PPS transmission tie lines, the deCordova and Johnson, if I can use the term off-site, outside, away from your site, transmission lines, I've been calling them that.

MR. EVANS: Okay.

CHAIR STETKAR: The deCordova and Johnson and the two normal preferred power system transmission tie lines, the controls and protection equipment for that complement of equipment are located in control house number one.

Control house number two picks up the Parker and Whitney transmission lines, and the two alternate preferred power transmission lines.

Now, given the fact that the normal preferred power supplies are normally energizing the safety buses from the reserve auxiliary transformers, if I lose control house number one, I wind up, potentially, from faults in the protection system, fires in the control house, control house falls down,

I don't know, some reason.

MR. EVANS: Right.

CHAIR STETKAR: I wind up losing two of my off-site transmission lines, which is why you can't consider them -- those two pairs as independent, and I wind up requiring a transfer of my safety buses on both units, to the alternate preferred supply, over to the unit auxiliary transformers.

So, my question is, why does -- and this is not safety licensing. This is electric power system designs. Why was a decision made to put both normal preferred power protection and controls in one house, and both alternates in the other house?

Was some sort of reliability analysis done, to make that conclusion? Was it done just so one is a red house and one is a blue house? Is it --

MR. EVANS: I don't recall any specific reason, design reason for doing it that way.

CHAIR STETKAR: Okay, because in terms of electrical transients and the units, it makes both units simultaneously vulnerable to conditions in control house one, in a different way than if you had them -- if you had the normal and alternate split between the two control houses.

MR. BARNES: I think one of the factors --

CHAIR STETKAR: You have to identify yourself.

MR. BARNES: This is Richard Barnes. I am with MNES.

I think one of the factors you have to consider is if you do try to split your east/west buses and your normal and alternate preferred, the other way, then each unit would wind up in -- like Unit 3 would wind up controlled by control house one and Unit 4 would be by control house two.

So, it was better to split them, and have both normal's in one house and both alternates in another, versus having all of one unit in one house and all of another unit in one house.

I think that gets you into GDC-17 difficulties.

CHAIR STETKAR: I guess I could have the alternate for Unit 3 and the normal for Unit 4 from one control house and vice-versa and avoid that concern.

MR. EVANS: Well, yes, if you did that, then you would have -- either way, you're going to have buses transferring, whether it's the RAT's transferring or the --

CHAIR STETKAR: It is just a question of,

do I put -- from failures in a geographically centered location someplace, do I -- what transients do I put two nuclear units in simultaneously, versus a single unit?

MR. EVANS: Okay.

CHAIR STETKAR: And that is always a question that comes up, when you have these shared systems, that fine, I know I will have some sort of transient on at least one unit, given some failure in a control house.

The question is, is there a feature of the design that can avoid simultaneous demands on both units, and this design seems to initiate simultaneous demands on both units.

Now, it's -- if they fail to transfer, the gas turbine generator still picks up, so, you know, it's a perturbation on the electrical systems. It's not something that's challenging safety related equipment.

But it is a demand for those electrical systems to respond in a different way that a different configuration might avoid.

MR. EVANS: Well, I think if I understand you, you're saying what if --

CHAIR STETKAR: Suppose I had --

MR. EVANS: -- if I had a normal and alternate preferred power system on it --

CHAIR STETKAR: Not from the same unit, but from cross units.

MR. EVANS: Yes, so, if you had that scenario, then one unit, the RAT's are going to be transferring over to the UAT's and the other unit, the UAT loads are going to be transferring over to the RAT.

So, you are going to have transfers going on in both units.

CHAIR STETKAR: Well, except that the normal UAT loads are all non-safety related stuff.

MR. EVANS: Right.

CHAIR STETKAR: So, you don't have the safety bus transfers.

MR. EVANS: That is right, yes.

CHAIR STETKAR: That is the way I was looking at it.

MR. EVANS: Yes, okay.

CHAIR STETKAR: You know, transfer power supplies to safety buses.

MR. EVANS: Okay.

CHAIR STETKAR: Which in our world, we have to think about.

MR. EVANS: Yes.

CHAIR STETKAR: Okay, I was just curious. The reason I asked it was, if there was some -- and Richard mentioned certainly, if -- you don't necessarily want one -- I mean, you could design it with one control house per unit.

But that might not necessarily be the most reliable design. But some decision was made to align them this way.

MR. EVANS: Yes.

CHAIR STETKAR: Okay, I don't -- you know, I don't particularly -- this doesn't merit further discussion, as far as we're concerned, but it's a curiosity that whenever -- and again, I am not trying to focus on -- everybody has got Fukushima on their minds, these days, and I'm not trying to focus on Fukushima. Believe me, I would have asked the same questions a year ago.

Just because I've looked at a lot of existing plants that have kind of strange shared electrical systems, and sometimes, there are features of the design that are -- from a risk perspective, are more risk tolerant than other design configurations.

Now, the current configuration of your switch yard, and I'm trying to understand kind of how

this stuff is shared and where things come from.

I don't know, you know, I'm familiar with breaker and a half, what do you guys call the center circuit breaker? You call it a tie breaker or -- I don't know what terminology you use.

If you're not familiar, the center breaker and the breaker and a half, there is one current configuration that the center breaker is a protection breaker for the Unit 4 alternate preferred power system, and a deCordova transmission line.

Now, deCordova is normally protected from control house one and the Unit 4 alternate is normally from control house two.

So, does that center breaker get protection signals from both control houses?

MR. EVANS: Yes, it should, yes.

CHAIR STETKAR: Okay, so, it's got four signals coming into it?

MR. EVANS: Well, for a line fault, say, on the deCordova line, it would demand a trip on that center breaker and --

CHAIR STETKAR: I mean, to isolate a fault on either of those lines, you're going to have to separate both of those breakers.

MR. EVANS: Right, and within the relay

house, there is primary back-up schemes and all of that.

CHAIR STETKAR: But that is within its own protection area?

MR. EVANS: Yes.

CHAIR STETKAR: And you know, what I am searching for is how much thought has gone into the design of the protection and control of this shared switching station, given the statements that I can read in words and look at the actual configuration of the transmission lines, both going off-site and connecting to the units.

MR. EVANS: Failure modes analysis was done, and --

CHAIR STETKAR: A single failure modes analysis?

MR. EVANS: Right, yes.

CHAIR STETKAR: Looking at single failures?

MR. EVANS: Right.

CHAIR STETKAR: And you're certainly single failure for this. I tend to look past single failures.

MR. EVANS: Right, but yes, that was the basis of the -- any single failures, would you

maintain one of the two off-site power sources?

CHAIR STETKAR: Okay, you're saying in the particular example that I raised for that, a place I used to worked called them tie-breakers, but the center breaker would need to have control signal -- protection signals coming in from both control houses.

MR. EVANS: It would have to.

CHAIR STETKAR: Because it's a shared --

MR. EVANS: It would have to.

CHAIR STETKAR: Shared protection zones, okay. Okay, here is a standard question I ask everybody.

It's clear that all the kV -- all the circuit breakers out in the switching station, and in deed, the circuit breakers in the plant switch yard, 345 kV by the turbine building, have dual trip coils, and it's pretty clear that there are double battery systems, both out in the switching station and in the plant switch yards, that power those things.

The question is, how many closing coils do each of those circuit breakers have?

MR. EVANS: That's a good question. I don't know the answer to that.

I know for Unit 1 and 2, I'm very familiar with that, but usually they have --

CHAIR STETKAR: Dual trip and usually, a single closing coil, unless you have a different breaker design.

The question arises that you have very high reliability of opening those circuit breakers, if I must then re-close those circuit breakers to reconnect off-site power into the units, I then become reliant on a single closing coil that has -- unless it's a very strange design, a single dc supply to it.

The question is then, what are the dc supplies to those closing coils? What is the battery life rated time on those dc supplies, and if you do get into an extended period of loss of off-site power, can you actually re-close those circuit breakers, and have you thought about a configuration of dc power, so that under a number of contingencies, you can actually re-connect at least one transmission line back into one of your -- you know, either of your units?

There are ways of doing that, and I was curious whether you had thought about that, at all?

MR. EVANS: I don't know specifically, we've gone into that much detail of the design.

CHAIR STETKAR: Yes.

MR. EVANS: We do have a power source, we plan on having a diesel generator, a small diesel

generator to be able to re-power the battery chargers, if there was an extended power --

CHAIR STETKAR: Is that for the -- the plant switch yards, or is that for all the battery charges on out into the switching station?

MR. EVANS: This is for the switching station, that I'm speaking of for the --

CHAIR STETKAR: The switching station?

MR. EVANS: For the switching station, so, we could reconnect that, you know, take manual action, obviously to do that.

CHAIR STETKAR: You guys don't own the switching station, though?

MR. EVANS: We don't own the switching station. That belongs to the transmission company, right.

CHAIR STETKAR: Okay.

MR. EVANS: But we have a agreements with them, and that feature would be in the agreement, that that capability exists and you know, it would be ready and available to power up the battery chargers, in the switching station.

CHAIR STETKAR: Oh, okay, do you have any notion, what the life -- the design -- and I know you're probably not far along, but do you have any

notion of the design life of the dc batteries without charging out there?

MR. EVANS: In the switching station?

CHAIR STETKAR: Yes.

MR. EVANS: No, I don't. I was curious about that, myself, and I looked through the design documents for the -- or the design reports from the transmission company, and they did not specify that level of detail.

CHAIR STETKAR: But you did say that out in the switching station, the current design is that you will have a diesel out there, to supply those battery chargers?

MR. EVANS: Yes, and that would be --

CHAIR STETKAR: And that is for both control houses, because there is one set of batteries in one control house and another set of batteries in the other control house, and they --

MR. EVANS: Right, and it could --

CHAIR STETKAR: And they talk to each other.

MR. EVANS: It may not be a permanently installed diesel. It may be like a portable diesel or something that could be hooked up to either one.

CHAIR STETKAR: Okay, let me --

MR. EVANS: You know, it doesn't take much.

CHAIR STETKAR: No, these are pretty modest.

MR. EVANS: Yes.

CHAIR STETKAR: Doesn't take much, until you need it, and then if you haven't got it, you sort of need it.

What about the -- if I work into the plant, and I look at the plant switching station, or the switch yard?

MR. EVANS: Switch yard.

CHAIR STETKAR: Switch yard, sorry, I used the wrong term, the plant switch yards, what are the -- do you know what the lives of those batteries are, and where the power supplies to their chargers come from?

MR. EVANS: The power supplies come off of 40-volt power from with inside the plant.

CHAIR STETKAR: Okay.

MR. EVANS: Non-safety 40-volt power. I do not know the life of those. Typically, it would be one hour or two hour time frame, but I don't think we have gotten to that level of detail in the design, but the power does come from 40-volt motor control centers

within the plant.

CHAIR STETKAR: Are those motor control centers --can you load those on the AAC gas turbine generators?

MR. EVANS: I believe so, Richard, right?

CHAIR STETKAR: I mean, without being real creative? They're supplied from either P1 or P2?

MR. BARNES: Yes.

CHAIR STETKAR: Okay, out in the plant switching station, there is a 300-foot section where three of the lines -- two of the 345 kV lines and the 161 kV line over to Units 1 and 2, cross over the two buses, and I looked at the configuration and I know how you -- you got central towers in the middle of the switch yard to support those lines, so that -- so, you can't get a line failure that is going to drape across both of the east and west buses?

MR. EVANS: Correct.

CHAIR STETKAR: A line failure, at most, would take out one bus.

MR. EVANS: Right.

CHAIR STETKAR: You know, given that, are there any additional design considerations like impact shields over the buses in that section, that even if a line came down, you know, it wouldn't take out the

bus?

MR. EVANS: No, we haven't planned on --

CHAIR STETKAR: Okay.

MR. EVANS: You know, just a single failure --

CHAIR STETKAR: A line will come down and it will take out one of the two buses, okay.

All right, and let's see, here is a -- I tried to look at the -- part of the failure modes and effects analysis, again, it looks at single failures of tie lines. It looks at single failures of transmission structures.

But the problem is, it looks at it only from the perspective of Units 3 and 4. It doesn't consider possible impacts over on Units 1 and 2.

Are there any transmission structures from Units 3 and 4, that contain the normal preferred power circuits for both Units 3 and 4?

The problem is, the single failure analysis is focused on, will a single failure disable both the normal and the alternate power supply to one of Units 3 or 4?

You know, and it's clear, from what I could see, that the answer to that question is no, there is no single failure that will take out both the

normal and the alternate to either of those units.

MR. EVANS: That is correct.

CHAIR STETKAR: Now, are there single failures that can take out both of the normal preferred power supplies, to both units, both of the alternate preferred power supplies to both units, or combinations of those things, or combinations of those things and power supplies to Units 1 and 2?

MR. EVANS: With regard to the transmission lines that go from the switching station to the switch yards, they are all on separate -- four separate structure sets.

CHAIR STETKAR: Therefore, so, you don't have, for example --

MR. EVANS: The two normal PPS's are not on the same --

CHAIR STETKAR: Okay, so, there are four separate -- the lines that -- on this drawing here, that are shown as alternate PPS, normal PPS, alternate PPS, and normal, those are four separate tower structures?

MR. EVANS: That is correct.

CHAIR STETKAR: Okay, okay, that answers that.

MR. EVANS: Now, with regard to your

question about Unit 1 and 2, the alternate PPS, this top one on the top one on the drawing, does share a transmission, a double circuit transmission line with one of the transmission lines going to Unit 1 and 2, I believe is the way it works.

CHAIR STETKAR: Okay, but that is the only one?

MR. EVANS: That is the only one.

CHAIR STETKAR: And I think I recall reading about one of them, okay, but the basic question that I had is answered by the four separate towers coming into the units, so, thank you.

MR. EVANS: Okay.

CHAIR STETKAR: I'm getting near the end, here.

MR. EVANS: No problem.

CHAIR STETKAR: So, trust me on this. There is a -- this is just one of those curiosities.

There is a section in the FSAR that -- it's 8.2.1.2.2 in the FSAR, that talks about plant switching station and transmission line testing and inspection.

There are a few items in there that says that part of the testing and inspections performed in the plant switch yard are oil sampling of power

transformers, oil samples are evaluated through the use of gas chromatography and dielectric break down analysis, the power test is typically performed on oil-filled equipment, along with other diagnostics tests to determine the transformers operating conditions.

I could not find any transformers. So, I was wondering, if you're doing testing on oil-filled transformers and committing to do that in the FSAR --

MR. WOODLAN: Well, that is at the switch yard, right, not the switching station?

CHAIR STETKAR: It says the plant switching station.

MR. WOODLAN: Okay.

MR. EVANS: Which page are you on?

CHAIR STETKAR: Well, I don't know. I excerpt these things, so, it's Section 8.2.1.2.2 of the FSAR Rev 1, and I don't have Rev 2.

MEMBER SHACK: It's 8.2.9.

MR. EVANS: It's 8.2.9, okay.

CHAIR STETKAR: The reason I raise this is that I don't like to see plant specific FSAR's that simply excerpt a bunch of criteria from generic documents and paste them in.

I get a bit concerned about that process.

So, you know, references to testing oil-filled transformers in a design that does not have oil-filled transformers makes me curious, or if there are transformers that are hiding there somewhere, that I didn't see, I was curious where they are.

Another reason I bring this up is, you've got some gas-filled bus work and your unit switch yards are a little different than most people's normal air circuit breakers and stuff, and it wasn't clear that I saw a real plant specific testing and maintenance commitments for those pieces of equipment.

MR. EVANS: Yes, we can take a look at that requirement, whether that is applicable for the switching station or not.

CHAIR STETKAR: Okay.

MR. EVANS: But obviously, for Unit 1 and 2, we have a real good program for preventative maintenance and predictive maintenance on our large prior transformers, obviously, for reliability purposes.

CHAIR STETKAR: I was going to say, most people do. There are other things to be concerned about.

MR. EVANS: Yes, the plan would be to use those same practices, both of our's and obviously, in

the switching station, the transmission service provider has a lot of experience and practices that they use there.

So, we would be adopting those same practices.

CHAIR STETKAR: Who owns the Unit 1 and 2 switch yard?

MR. EVANS: The switch yard for Unit 1 and 2 is also owned by the transmission service provider. It's a little bit different.

Some of the equipment in it is actually owned by Luminant. When Unit 1 and 2 was built, Texas was a regulated market, and the company, the transmission company and the company, our company that built the power plant were one in the same company.

CHAIR STETKAR: Okay.

MR. EVANS: So, the switch yard was designed under that ownership and alignment.

Now, we're in a de-regulated market. We are actually still part of the same company, but it's a regulated part and a de-regulated part, so, there is a lot of separation required. That is why this design has basically two switch yards.

CHAIR STETKAR: Units 1 and 2 have generator output breakers, or they have to open the

breakers in the switch yard?

MR. EVANS: You have to open the breakers in the switch yard.

CHAIR STETKAR: Yes, so, that is why you need control over that.

MR. EVANS: Right.

CHAIR STETKAR: Okay, but the question is, you already do have an existing agreement with the transmission service provider for maintenance and testing and stuff --

MR. EVANS: Correct.

CHAIR STETKAR: -- in the Units 1 and 2 switch yards?

MR. EVANS: That is correct.

CHAIR STETKAR: And that's been working pretty well?

MR. EVANS: Working very well and we anticipate to carry that on with Unit 3 and 4, as well.

CHAIR STETKAR: That is all I have on the off-site power system.

Now, I'll let you get to your next slide here, unless anybody -- I'll wake up the other members, here.

Yes, let's -- I will let you finish up,

now.

MR. EVANS: Okay, we've talked about this, got into the off-site power system, as it is in the grid in Texas, a little bit, but I wanted to share some information because it is part of the site specific design about the electric power system grid and the vicinity of Comanche Peak.

As I mentioned, the independent system operator for this area is the Electric Liability Council of Texas. The map that you see on the graph there represents both the physical and the geographical and the electrical boundaries of the Electric Liability Council of Texas.

CHAIR STETKAR: Does ERCOT play better with its neighbors these days, than it used to?

MR. EVANS: ERCOT is still an independent.

CHAIR STETKAR: Okay.

MR. EVANS: It is a grid of its own. I had dc ties going to other grids, but there are no --

CHAIR STETKAR: They are still --

MR. EVANS: Independent.

CHAIR STETKAR: -- an autonomous group?

MR. EVANS: That is correct.

CHAIR STETKAR: Okay.

MR. EVANS: The major load centers within

ERCOT are the major metropolitan areas, such as Dallas-Fort Worth in North Texas, Houston, down in South Texas, Austin-San Antonio corridor and Central Texas and then South Texas loads, as you go down south.

Major generation stations are located around those metropolitan areas, and so, most of the large generating stations are around Dallas-Fort Worth and in Central Texas. So, East and Central Texas.

Comanche Peak is located southwest of Fort Worth, so, about right there, where the arrow is, and as we talked about a minute ago, currently, Comanche Peak site consists of two units that are pressurized water reactor Westinghouse units, that are about halfway through their mid-life into their 40-year license.

The local service transmission provider is Encore Electric Delivery Company, and they own, as we mentioned a minute ago, they own the existing Comanche Peak 1 and 2 switch yard and they will own and operate the Unit 3 and 4 switching stations.

So, to wrap up, then, kind of as far as the R-COLA for Sub-Section 8.2, it's incorporated by reference. There are no departures. There are nine COL information items, which we have addressed. There

is one open item related to anti-motoring time delay, which I'll get to on the next slide.

There are three confirmatory items and there are no proposed license conditions for this sub-section.

The one open item that we have, number 8.2-1, is related to an inconsistency within the DCD Chapter 15 language related to the anti-motoring protective relay for the main generator output breaker.

Currently, the staff is working with Mitsubishi to resolve and clarify that question, so, it is basically a DCD question at this point.

If the result of how that clarification is made impacts the R-COLA, then we would make the necessary changes to the R-COLA to reflect that.

But it's really not a site specific --

CHAIR STETKAR: Do you expect this to be resolved through the DCD?

MR. EVANS: That is correct.

CHAIR STETKAR: Okay.

MR. EVANS: Okay, then moving on to 8.3, which is the onsite power systems, the DCD is incorporated by reference. There are no departures. There are seven COL information items. The NRC SER

summary is that there are no open items for this sub-section.

There is one confirmatory item and there are no proposed license conditions.

Then finally, Section 8.4 station blackout, again, this is incorporated by reference. We have no departures. There are no COL information items for 8.4. There are no SER open items. There is one confirmatory item and there are no proposed license conditions.

CHAIR STETKAR: There is only one -- there was one change that you did make on the in-plant distribution of loads, right?

You changed -- I can't even remember what it was and the --

MR. EVANS: The site specific?

CHAIR STETKAR: Yes, on site specific. There was cooling tower fans --

MR. EVANS: Right.

CHAIR STETKAR: -- or something like that.

MR. EVANS: The way, with our Lake Granbury and our make-up pumps, the way the standard design, I believe has those fed off of plant buses, where our's are fed off of --

CHAIR STETKAR: You dropped them down to

load centers or the --

MR. EVANS: Well, the make-up stations, pumps are fed off a local distribution --

CHAIR STETKAR: Yes, that is it.

MR. EVANS: Not off of the plant, because of the distance.

CHAIR STETKAR: But that was the only change that I could see on any of the bus loading.

MR. EVANS: I think so. There may have been the blow-down pumps or something like that, the cooling tower fans may have --

CHAIR STETKAR: I think it was cooling tower.

MR. EVANS: May have been a little different.

CHAIR STETKAR: The cooling tower fans were added on load centers, or I can't remember whether it was the --

MR. EVANS: That is possible.

CHAIR STETKAR: But that is the only thing that has been changed?

MR. EVANS: Correct.

CHAIR STETKAR: Okay, thank you. Any of the members have any electrical questions? You folks get awfully quiet, except for Charlie.

With that, we will take a break, before the staff comes up. The staff may not have a long time, but some of us need a break.

We will reconvene, I'll be generous, at 3:25 p.m.

(Whereupon, the above-entitled matter went off the record at 3:05 p.m. and resumed at 3:25 p.m.)

CHAIR STETKAR: Okay, we are back in session and we'll hear from the staff on the COLA Chapter 8.

MR. MONARQUE: Okay, thank you, John. I have some opening remarks.

I just want to say, staff's review, I think Tania will agree will agree with me on this, I just wanted to reiterate that staff's review of the safety evaluation was based on Revision 1 of the COL, which incorporated Revision 2 of the DCD.

In June 28th, or July, beginning of July, we did receive Rev 2 of the COL, however, the staff has not been able to look at it, yet. We're still reviewing it, and I will give ACRS copies of the DVD's, for the COL Rev 2.

CHAIR STETKAR: Yes, thanks.

MR. MONARQUE: So, with that, I'll go ahead and turn it over to Ngola Otto, the project

manager, Chapter PM.

MR. OTTO: Okay, thank you, Steve. Good afternoon, everyone. I'm Ngola Otto. I'm the project manager for Chapter 8 Comanche Peak, and here with me is Tania, who is a technical reviewer, and she is going to present the open items and the staff's discussion of that.

We had a total of 36 RAI questions, and we have two open items that we're going to discuss this afternoon. I'm going to turn it over to Tania.

MS. MARTINEZ-NAVEDO: Good afternoon. As introduced before, my name is Tania Martinez-Navedo with the electrical engineering branch in the Office of New Reactors.

I am going to discuss the two open items that Comanche Peak has outstanding at this point.

The first open item would be open item 8.01-1 and it pertains to the switcher description, the issue being that staff believes GDC-5 is applicable to the Comanche Peak units, because -- and to be clear, the switching station is shared between the units, to be consistent with the Applicant's terminology.

The COL Applicant was requested to address how the switching station, and the outside power meets

GDC-5, in terms of capacity of the transmission lines and the switcher components, in order to support the loads, in the event of an accident in one unit, and the other unit being in an orderly shut-down.

At this point, looking to a path forward for resolution, supplemental response has been submitted by the Applicant and it's currently under staff's review.

CHAIR STETKAR: Okay.

MS. MARTINEZ-NAVEDO: The second open item is open item 8.02-1 pertains to outside power stability studies.

The issue is that there is an inconsistency between the language in the DCD and the language in the R-COLA, meaning Comanche Peak, and it has to do with the maintained voltage levels for the RCP's, and the three-second time delay after a turbine trip.

The path forward for resolution on this particular item is being carried out with the DCD, and because it's more a design feature, and we are pursuing a resolution in that forum.

I believe like the Applicant has stated before, that when the changes are made in the DCD to clarify the sequence of events after a turbine trip,

that will be carried out into the Comanche Peak FSAR.

That is all. Any questions?

CHAIR STETKAR: Yes, I had -- when I was making some notes here, I think that your -- there is a -- in Section 8.1.4 of the SER, there is a statement saying, "However, the Applicant has not demonstrated whether or not the SSC's important to safety that are shared among nuclear units will not significantly impair their ability to perform their safety functions, including an accident in one unit, and an orderly shut-down and cool-down of the remaining unit."

That is the topic of this open item, is that right?

MS. MARTINEZ-NAVEDO: Correct.

CHAIR STETKAR: Those SSC's important to safety that are shared between the two units are the switching station?

MS. MARTINEZ-NAVEDO: Correct.

CHAIR STETKAR: Okay, I just got kind of hung up on what SSC's important to safety, because that term has a different connotation sometimes.

MS. MARTINEZ-NAVEDO: Okay.

CHAIR STETKAR: I did have a question, though, about -- and perhaps, I wasn't understanding

the interface between the DCD and the FSAR correctly.

The FSAR clearly states, and they even have a drawing that shows that a minimum one-hour rated fire barrier is provided between all transformers.

This is in particular, the unit auxiliary transformers, the reserve auxiliary transformers, and the main transformer.

There are three-hour fire barriers between the transformers and the turbine building wall, and there are three-hour fire barriers, if I can find my drawing here, between the unit auxiliary transformers and the reserve auxiliary transformers.

But the fire barriers between any pair of adjacent transformers within those groups, at least in the plant specific design, are rated at one-hour.

The DCD Revision 3 Section 8.2.1.2 states, "The main transformer, unit auxiliary transformers and reserve auxiliary transformers are located in the area of the main transformer and unit auxiliary transformers and area of reserve auxiliary transformer, respectively, separated by three-hour rated fire barriers in the transformer yard adjacent to the turbine building."

My question is, is that -- is the plant

specific design that has only one-hour fire barriers between those transformers, a departure from the design certification, which seems to indicate that there are three-hour fire barriers between transformers, or am I somehow mis-interpreting --

MR. MONARQUE: John?

CHAIR STETKAR: The plant specific seems to be pretty clear, because there is a drawing that shows which is which.

MR. MONARQUE: Excuse me, you just read from DCD Revision 3, correct?

CHAIR STETKAR: I did.

MR. MONARQUE: Okay, this is Rev 1. Rev 1 incorporates Rev 2. So, we're a step behind.

CHAIR STETKAR: Okay.

MR. MONARQUE: The COL may have addressed it, incorporate Revision 3 of the DCD, and it may have incorporated, but we're still reviewing the incorporation of Revision 3 DCD, correct?

MS. MARTINEZ-NAVEDO: Yes, I would have to look for the --

CHAIR STETKAR: Okay, that would -- I may be caught --

MR. MONARQUE: You're caught between --

CHAIR STETKAR: -- between revs.

MR. MONARQUE: Yes.

CHAIR STETKAR: All right, let's just look at it, because the problem is, the words in Rev 3 of the DCD that I just read, I read verbatim and they're not particularly succinct or clear, but it only refers to three-hour fire barriers.

MR. MONARQUE: And it may have or may not have been addressed in Rev 2. We'll have to go back and take a look at that.

CHAIR STETKAR: Yes, I know there were some questions about it, you did have some questions about the fire barriers --

MR. MONARQUE: Okay.

CHAIR STETKAR: -- between the transformers in the current -- the review.

MR. MONARQUE: Yes.

CHAIR STETKAR: If I can quote from the SER, 8.2.4 of your SER of what you read, "In response to RAI-2577 question 8.02-7," and this is not a quote, I'll just paraphrase it, because it's a long paragraph.

It says that the transformers are protected by water spray deluge, regarding fire barriers, the Applicant states that the one-hour fire barrier located between each transformer conforms to

the requirements of Section 10.23.1.1 of NFPA 804.

Regarding acceptability of the one-hour fire barrier, the Applicant stated that there is a reasonable expectation that the one-hour fire barrier will prevent a fire on one side of that barrier from propulgating to the other side of the fire barrier, within its fire resistence rating.

Additionally, it is also reasonable to expect that the plant fire brigade will be able to commence manual fire mitigation operations sooner than one hour, which provides defense and depth to limit the spread of a fire to adjacent transformers.

So, it seems as though the conclusions in your safety evaluation say, "Well, they've got fire protection and yes, they've got a fire brigade," and you know, it's pretty reasonable to expect that a fire won't go through that one-hour fire barrier and it will probably go start to fix to get alarm, to put out that fire.

Large oil-fill transformers don't tend to behave like a fire in your trash can. They tend to explode. They tend to be a rather energetic type of a fault, in many cases.

So, the question is, does a one-hour fire barrier provide adequate protection against a

transformer that blows up, and have you thought about that, and more fundamentally, if in deed, the design certification document says that there should be three-hour fire barriers, regardless of what might be reasonably expected or what might be sort of kind of okay to assume might happen, is in deed, the one-hour fire barrier a departure from the certified design?

And I don't know what is in Rev 2 of the DCD, because I didn't go back and look at that.

So, I guess the two questions are, and I'm not sure if I'm caught between revs of the DCD, whether it is or not a departure from the design certification, and this justification about reasonable expectation and expectation that the fire brigade will probably be able to put out a fire in one hour, doesn't help an awful lot, if the transformer explodes, because it's pretty much over before the fire brigade gets a chance to go do something. You can put out the burning oil and all that sort of thing, but impact damage and so forth, may not be protected.

So, that is kind of a question I had for you, if you can follow up on it.

MR. MONARQUE: Okay.

MR. HAMZEHEE: We'll go back and address it, but does Luminant know if they're one-hour or

three-hour fire barriers?

CHAIR STETKAR: They are one-hours. There is a drawing in the FSAR, at least the version of the FSAR that I have.

MR. HAMZEHEE: That is a one-hour?

CHAIR STETKAR: That shows explicitly where the one-hour and three-hour barriers are.

I can see their protection notion for one-hour and three-hour. They have three-hours that protect damage to the turbine building wall, from transformer fires. There is a three-hour barrier between the unit auxiliary transformer area and the reserve auxiliary transformer area, so, those two -- the normal and preferred power supplies, if you will, are separated by three-hour.

But within each of those areas, you know, there is four unit auxiliary transformers, the three main transformer sections in one area, and those are all separated by one-hour barriers.

Within the reserve auxiliary transformers, the four transformers that normally feed the safety buses, those four transformers are only separated by one-hour barriers, between the transformers, at least in Rev 1 of the FSAR.

Whether that has changed or not --

MR. MONARQUE: Okay, we'll check on that.

CHAIR STETKAR: Okay, I don't have anything more. Do any of the other members have anything more?

Miracles sometimes happen. With that, I think we are closed for today.

I'd like to thank, very much, MHI, MNES, Luminant and everybody for your presentations and bearing with us under the questioning.

I think we learned a lot, and I think we had a good discussion. I'd like also to thank the staff and with that, we will adjourn.

(Whereupon, the above-entitled matter concluded at 3:40 p.m.)

Presentation to ACRS

Chapter 10: Steam and Power Conversion System

August 17, 2011

Mitsubishi Heavy Industries, Ltd.

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Acronyms (1/3)

AB	:Auxiliary Building
ASSS	:Auxiliary Steam Supply System
ASTM	:American Society for Testing Materials
CCF	:Common Cause Failure
CFS	:Condensate and Feedwater System
COL	:Combined License
CPS	:Condensate Polishing System
C/V	:Containment Vessel
CWS	:Circulating Water System
DWST	:Demineralized Water Storage Tank
EFW	:Emergency Feedwater
EFWS	:Emergency Feedwater System
EOST	:Electrical Overspeed Trip
EPRI	:Electric Power Research Institute
FAC	:Flow Accelerated Corrosion
FATT	:Fracture Appearance Transition Temperature
FSAR	:Final Safety Analysis Report
GSS	:Gland Seal System
HPT	:High Pressure Turbine

Acronyms (2/3)

ITAAC :Inspections, Tests, Analyses, and Acceptance Criteria
LPT :Low Pressure Turbine
LWMS :Liquid Waste Management System
MCES :Main Condenser Evacuation System
MFIV :Main Feedwater Isolation Valve
MFRV :Main Feedwater Regulation Valve
MFBRV :Main Feedwater Bypass Regulation Valve
MFW :Main Feedwater
MOST :Mechanical Overspeed Trip
MS :Main Steam
MSBIV :Main Steam Bypass Isolation Valve
MSDV :Main Steam Depressurization Valve
MSIV :Main Steam Isolation Valve
MSLB :Main Steam Line Break
MS/R :Moisture Separator Reheater
MSRV :Main Steam Relief Valve
MSRVBV:Main Steam Relief Valve Block Valve
MSS :Main Steam Supply System
MSSV :Main Steam Safety Valve

Acronyms (3/3)

NSSS :Nuclear Steam Supply System
RAI :Request for Additional Information
RB :Reactor Building
RCS :Reactor Coolant System
RG :Regulatory Guide
SCIS :Secondary Side Chemical Injection System
SER :Safety Evaluation Report
SG :Steam Generator
SGBDS :Steam Generator Blowdown System
SGTR :Steam Generator Tube Rupture
SGWFCV:Steam Generator Filling Control Valve
SRP :Standard Review Plan
TB :Turbine Building
TBS :Turbine Bypass System
TBV :Turbine Bypass Valve
TCS :Turbine Control System
T/G :Turbine Generator
UT :Ultrasonic Testing

DCD CHAPTER 10: Steam and Power Conversion System

Section		Major Contents
10.1	Summary Description	Design Feature of Steam and Power Conversion System
10.2	Turbine - Generator	**10.2.1 Design Basis**
		10.2.2 Description
		10.2.2.1 General Description
		10.2.2.2 Component Description
		10.2.2.3 Control Function
		10.2.3 Turbine Rotor Integrity (Open item)
		10.2.3.1 Materials Selection
		10.2.3.2 Fracture Toughness
		10.2.3.3 Preservice Inspection
		10.2.3.4 Turbine Rotor Design
		10.2.3.5 Inservice Inspection

DCD CHAPTER 10: Steam and Power Conversion System

Section		Major Contents
10.3	Main Steam Supply System	10.3.1 Design Basis
		10.3.2 Description
		10.3.3 Safety Evaluation
		10.3.4 Inspection and Tests
		10.3.5 Water Chemistry
		10.3.6 Steam and Feedwater System Materials (Confirmatory item)

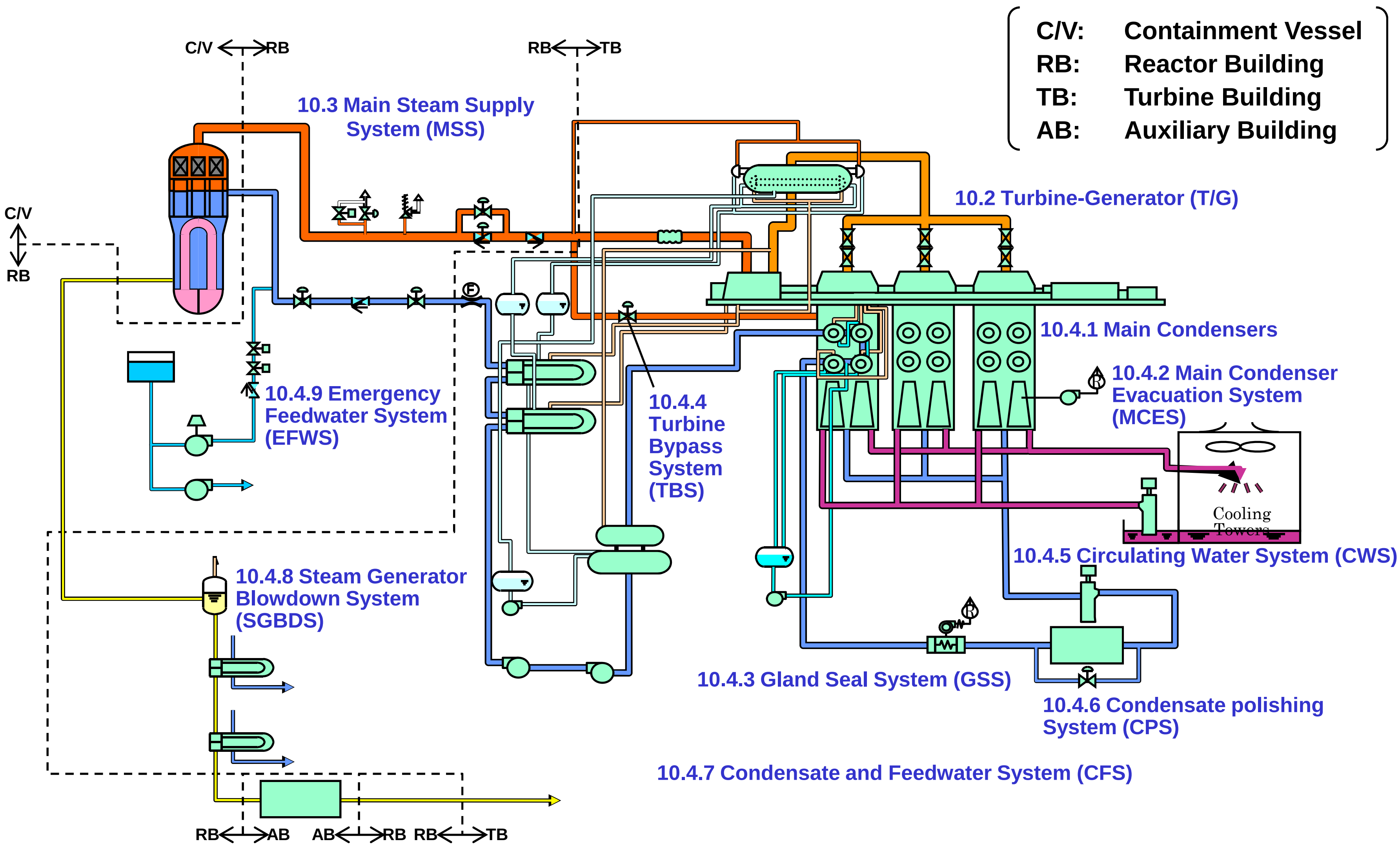
DCD CHAPTER 10: Steam and Power Conversion System

Section		Major Contents
10.4	Other Features of Steam and Power Conversion System	10.4.1 Main Condensers
		10.4.2 Main Condenser Evacuation System
		10.4.3 Gland Seal System
		10.4.4 Turbine Bypass System
		10.4.5 Circulating Water System
		10.4.6 Condensate Polishing System
		10.4.7 Condensate and Feedwater System
		10.4.8 Steam Generator Blowdown System
		10.4.9 Emergency Feedwater System
		10.4.10 Secondary Side Chemical Injection System
		10.4.11 Auxiliary Steam Supply System

10.1 Summary Description

US-APWR

➢ **Design Features of Steam and Power Conversion System**

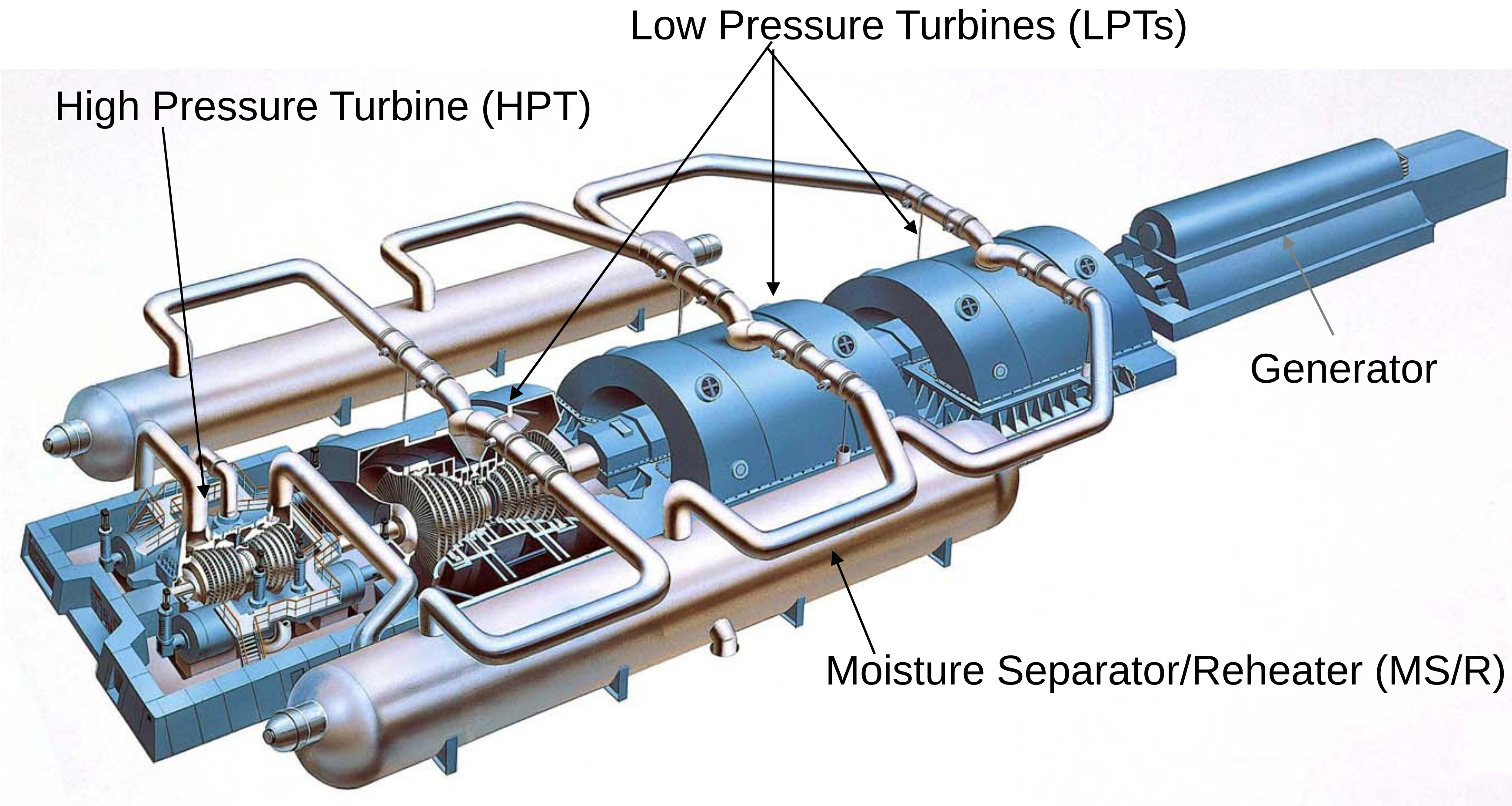


10.1 Summary Description

➢ Design Features

Rated NSSS power (MWt)	4,466
Steam Generator Outlet Press. (psig)	957
Quantity of Steam Generator	4
Total Steam Flow Rate from SG (lb/hr)	20,200,000
Steam Turbine Performance	
Type of Steam Turbine (-)	TC6F-74
Rotating Speed (rpm)	1,800
Generator Output (MWe)	1,625
Exhaust Pressure (inHgA)	2.6
Generator Rating	
Capacity (MVA)	1,900
Power Factor (-)	0.9

10.2 Turbine–Generator (T/G)



10.2 Turbine–Generator (T/G)

- The T/G is a non safety-related system
- The T/G could be a potential source of a high-energy missile, which could cause damage to safety-related equipment or systems
- Turbine and control/protection system are designed so that turbine missile generation probability satisfies the requirement of SRP which is less than 1 x 10^{-5} per year assuming proper inspection and test frequency
- The orientation of the T/G is such that a high-energy missile would be directed at approximately 90 degrees away from the safety-related structures

10.2 Turbine–Generator (T/G)

➢ Major RAIs (Open items)

RAI No.	Question 10.02.03-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
574-4633	1 (Open Item 10.2.3-1)	**Turbine Rotor Integrity:** **What type of rotor material shall be applied to the US-APWR LP rotor?**	➢ US-APWR LP rotor material is an MHI proprietary material but is similar to ASTM A470 Grade C, Class 6. ➢ There are some minor differences in chemical composition and mechanical properties.
		Turbine Rotor Integrity: **How do the material properties relate to those used in the turbine missile analysis?**	➢ Yield Strength (0.2% offset) is used in the turbine missile analysis, which is minimum value specified in the purchase specification and as-built values will be confirmed. ➢ Impact Strength, FATT and Upper Shelf Energy Level will be confirmed on the as-built rotors to confirm that Kic used in the missile analysis is adequate.

10.2 Turbine–Generator (T/G)

➢ Major RAIs (Open items)

RAI No.	Question 10.02.03-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
574-4633	9 (Open Item 10.2.3-2)	**Turbine Rotor Integrity: The applicant's response provided acceptance criteria for the 50% FATT and Charpy V-notch energy which do not meet the acceptance criteria of -18ºC (0ºF) and 8.3kg-m (60ft-lbs, 81J), respectively, as provided in SRP Section 10.2.3. Provide a discussion on why the material properties ensure that the turbine rotor has adequate fracture toughness during startup and normal operation.**	➢ Criteria for the 50% FATT and Charpy V-notch energy in the purchase specification is similar to those specified in ASTM A470 Grade C, Class 6、which is not as conservative as SRP criteria. A470 / SRP 50%FATT (MAX. ºC): -7 / -18 V-notch E (Min. J at RT): 61 / 81 ➢ Fracture toughness Kic used in the turbine missile analysis can be achieved if the actual 50% FATT and Charpy V-notch energy are within the range of specified number. Kic at the center bore core of the actual full integral rotors is surely expected to be greater than 200ksi*in$^{1/2}$. ➢ Therefore, MHI specification of LP rotor material can surely secure the turbine missile ejection probability less than 1*10^{-5} per year.

10.2 Turbine–Generator (T/G)

➢ Major RAIs (Open items)

RAI No.	Question 10.02.03-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
574-4633	11 (Open Item 10.2.3-4)	**Turbine Rotor Integrity: The non-bored rotor design should be deleted from the US-APWR FSAR , or provide the following:**	➢ The non-bored rotor design can be applied without sacrificing reliability of the LP rotors.
		➢ **Specific destructive testing that can confirm the material properties at the core region, and/or more extensive test results.**	➢ Destructive testing at the center core region will not be performed. ➢ Measured mechanical properties of the center bore core of full integral rotor with drum diameter of more than 100 inch shows that all the mean values of the mechanical properties $\pm$ 3σ (99.7% reliability) are secured to satisfy the minimum values of the purchase specification.

Continued on next page

10.2 Turbine–Generator (T/G)

➢ Major RAIs (Open items)

RAI No.	Question 10.02.03-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
Continued from previous page			
574-4633	11 (Open Item 10.2.3-4)	**Turbine Rotor Integrity:** **The non-bored rotor design should be deleted from the US-APWR FSAR , or provide the following:**	
		➢ **Specific non-destructive testing that can detect defects at the center core region, or provide specific in-service non-destructive examinations, taking into consideration the material properties and the presence of internal defects of the as-built turbine rotor cannot be confirmed.**	➢ 100% ultrasonic inspection after periphery machining of the as-built rotors will be carried out to define the initial internal defect size and location. ➢ Kic used in the turbine missile analysis has suitable margin against the minimum Kic of the actual rotors. ➢ We believe that UT inspection at the manufacturing stage is sufficient to ensure the integrity of the turbine rotor.

10.2 Turbine–Generator (T/G)

➢ Major RAIs (Closed)

RAI No.	Question 10.02-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
598-4754	3	**<u>Control Function:</u>** **The description of the turbine overspeed protection systems should clearly indicate what parts are shared. The response should include schematic diagrams that show these flow paths, applicable components, and valves being actuated.**	➢ NRC/MHI had a face to face meeting on Nov. 2, 2010 at NRC office. ➢ MHI provided: ✓ Simplified schematic diagram of the turbine control system, which shows what parts are independent and what parts are shared between the TCS, EOST and MOST ✓ Extraction non-return valve arrangement, which also is the part of the turbine protection system.

Continued on next page

TCS: Turbine Control System
EOST: Electrical Overspeed Trip,
MOST: Mechanical Overspeed Trip

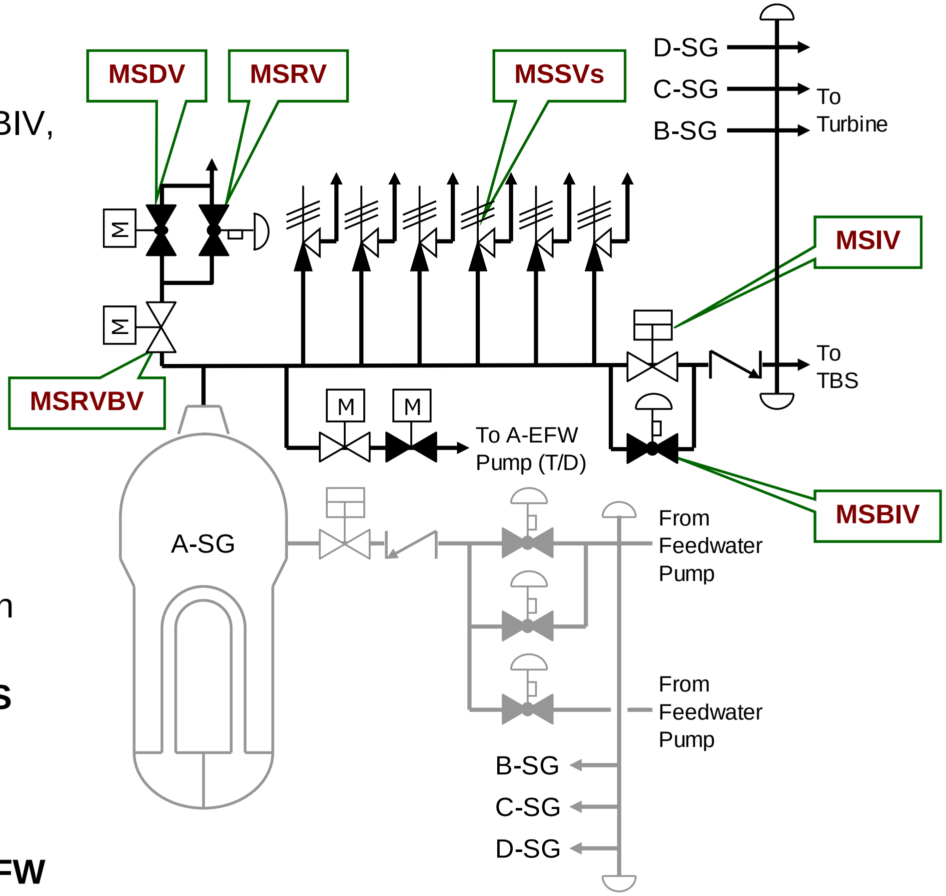
10.2 Turbine–Generator (T/G)

➢ Major RAIs (Closed)

RAI No.	Question 10.02-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
Continued from previous page			
598-4754	3	**<u>Control Function</u>: The description of the turbine overspeed protection systems should clearly indicate what parts are shared. The response should include schematic diagrams that show these flow paths, applicable components, and valves being actuated.**	➢ Following DCD sections modified based on the above discussion: ✓ 10.1.2 Protective Features ✓ 10.2.1.1 Safety Design Bases ✓ 10.2.2.2 Component Description ✓ 10.2.2.3 Control Function ➢ Following Table and Figures will be added in the next revised DCD ✓ Table 10.2-5 Inspection and Test Requirement for Overspeed Trip Devices ✓ Figure 10.2-2 Arrangement of extraction non-return valves ✓ Figure 10.2-3 Simplified schematic diagram of turbine control and protection system

10.3 Main Steam Supply System (MSS)

- **The MSS transports steam from the SGs to the HPT and to the MS/R.**
- **The MSS is safety-related system with following safety functions:**
  - ✓ **Containment isolation:** MSIV, MSBIV, MSRVBV, MSSVs, MS drain line isolation valves and normally closed manual valves
  - ✓ **Main steam isolation:** MSIVs and MSBIVs (1 per each MS line)
  - ✓ **Over-pressure protection of SG secondary side:** 24 MSSVs with 105 % of rated steam flow rate (6 MSSVs per each MS line)
  - ✓ **Radioactivity release restriction during SGTR:** 4 MSDVs (1 per each MS line) in conjunction with EFWS
  - ✓ **Core decay heat removal and RCS cooling during safe shutdown:** 4 MSDVs (1 per each MS line) in conjunction with EFWS
  - ✓ **Steam supply to turbine-driven EFW pump:** Two steam supply lines with 100 % capacity to the turbine-driven EFW pump



10.3 Main Steam Supply System (MSS)

➢ Major RAIs (closed)

RAI No.	Question 10.03-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
329-1860	1	-The issue of water (steam) hammer, relief valve discharge loads, and water entrainment effects as described in SDC 4 -Operating and maintenance procedures to alert plant personnel to the potential for, and means to minimize, water (steam) hammer occurrences	➢ MHI provided: ✓ Design of the MSSS components and piping supports consider steam hammer forces resulting from rapid closure of the turbine stop valve, as well as fluid forces resulting from safety and relief valve actuations ✓ COL item to develop and implement operating and maintenance procedures to avoid water (steam) hammer, relief valve discharge loads, and water hammer entrainment effects.

10.3 Main Steam Supply System (MSS)

➢ Major RAIs (Confirmatory Item)

RAI No.	Question 10.03.06-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
250-2143	4	-Recommend: Address Section 10.3.6 of RG 1.37 in DCD Table 1.9-1 **[Confirmatory Item 10.3.6-04]**	➢ Table 1.9-1 has been revised to include Section 10.3.6 in US-APWR DCD Revision 3 RAI Tracking Report revision 0 issued as MUAP-11021.
250-2143	2	-Recommend: Address Section 10.3.6 of RG 1.50 in DCD Table 1.9-1 **[Confirmatory Item 10.3.6-02]**	➢ Table 1.9-1 has been revised to include Section 10.3.6 in US-APWR DCD Revision 3 RAI Tracking Report revision 0 issued as MUAP-11021.

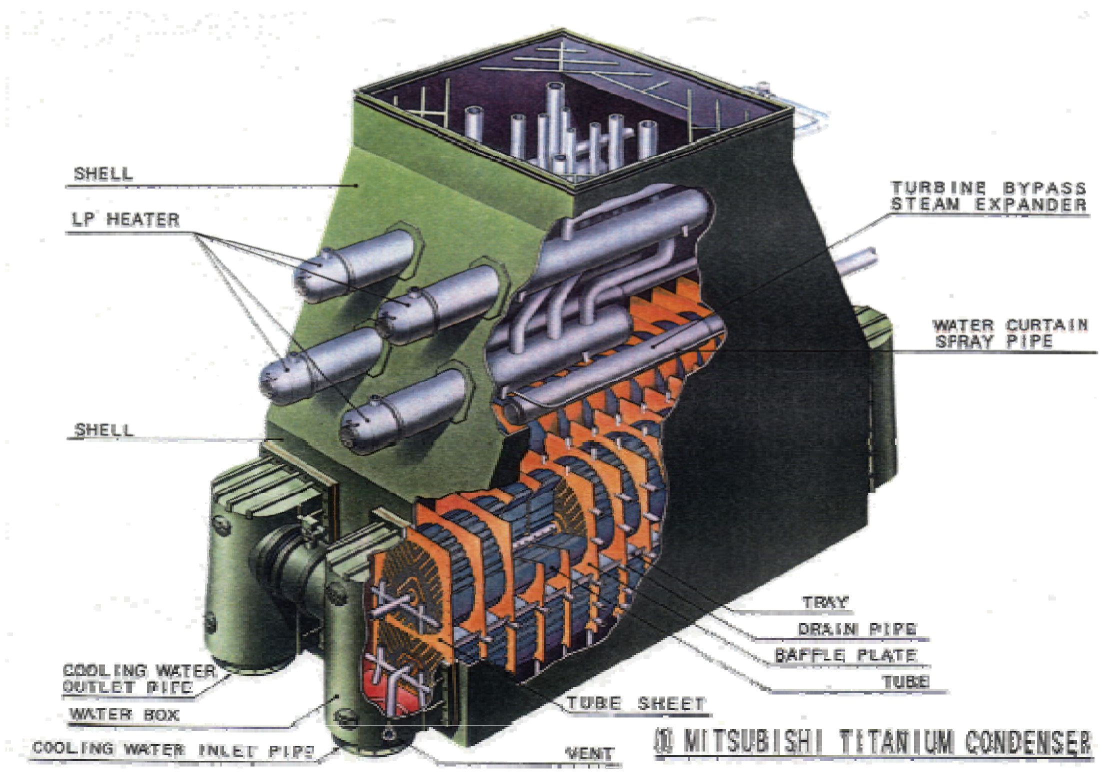
10.3 Main Steam Supply System (MSS)

➢ Major RAIs (Confirmatory Item)

RAI No.	Question 10.03.06-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
500-4012	12	-Modify DCD to perform a final system design evaluation of all ASME Code Class 1 and 3, as well as non-ASME Code Class, system or portions of systems susceptible to FAC **[Confirmatory Item 10.3.6-12]**	➢ MHI provided: ✓ The final design will be evaluated when complete, and additional material upgrades will be made where necessary to provide reasonable assurance that the systems maintain their minimum design wall thickness for a design life of 40 years ➢ Subsection 10.3.6 has been revised to incorporate RAI response in US-APWR DCD Revision 3.

10.4.1 Main Condensers

- The main condenser is a non safety-related system.
- The main condenser functions to condense and deaerate the exhaust steam from the main turbine and provides a heat sink for the turbine bypass system.



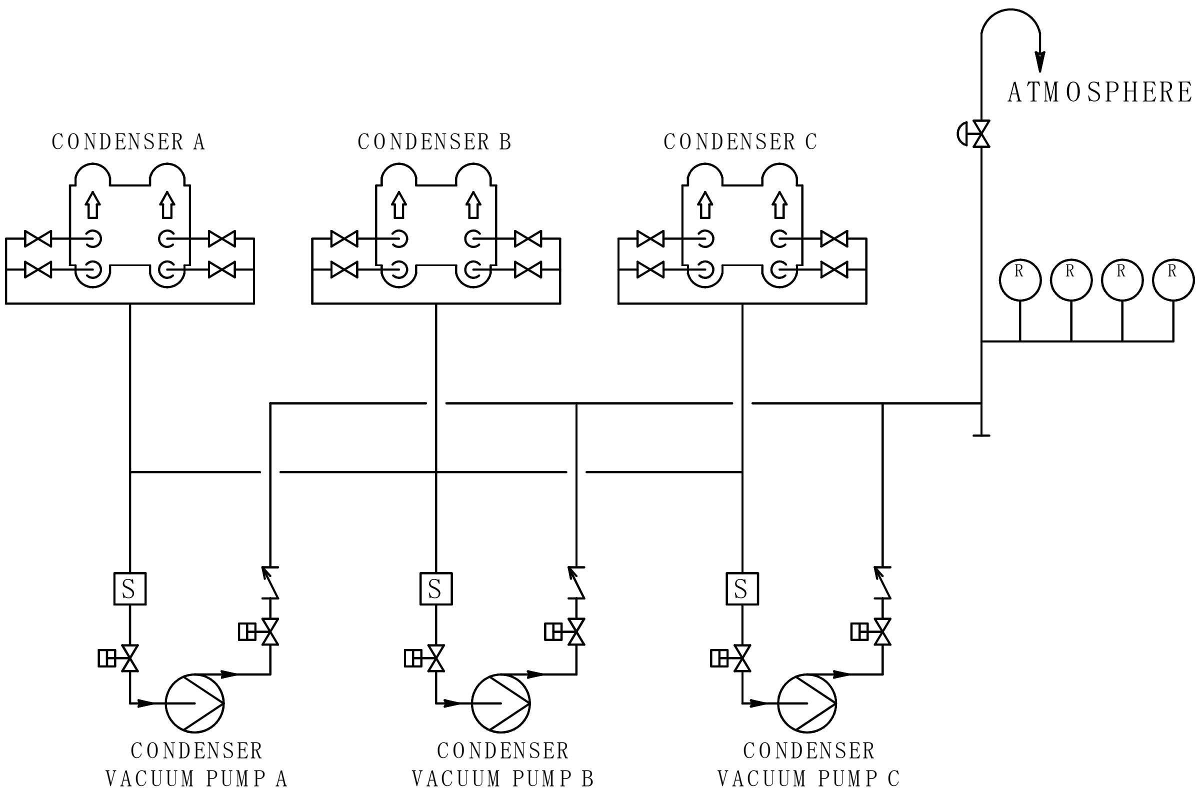
10.4.1 Main Condensers

➢ Major RAIs (closed)

RAI No.	Question 10.04.01-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
245-2176	2	**Potential Explosion due to Hydrogen Buildup**	➢ The noncondensable gasses in main condenser is mainly air, nitrogen and ammonia. Therefore, hydrogen buildup is not expected. ➢ The noncondensable gasses are removed from main condenser by vacuum pumps during normal operation, which further decreases any potential hydrogen buildup.
434-3266	2	**Revise the Subsection 10.4.1 of DCD to reflect the response to RAI 245-2176 Question 10.4.2-2**	➢ DCD has already been revised.

10.4.2 Main Condenser Evacuation System (MCES)

- The MCES is a non safety-related system.
- The MCES removes noncondensable gases from the main condenser during plant startup and normal operation.
- The MCES establishes and maintains a vacuum in the main condenser.



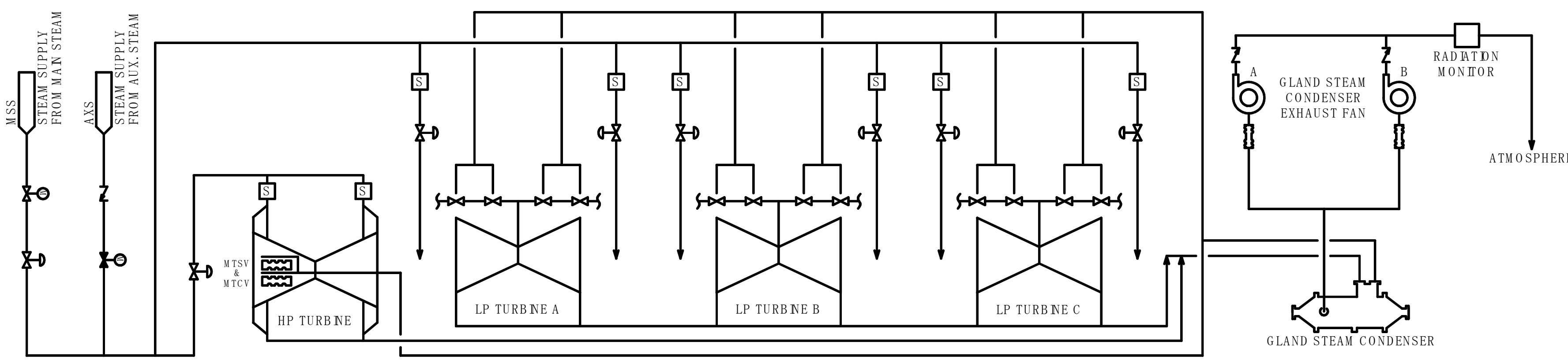
10.4.2 Main Condenser Evacuation System (MCES)

➢ Major RAIs (closed)

RAI No.	Question 10.04.02-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
246-2177	1	**-Operating procedure for control release of radioactive materials - Unacceptable level of radiation and alarm setpoint. - Location of radiation monitor**	➢ The operating procedure, unacceptable level of radiation and alarm setpoint are addressed in Subsection 11.5.2.4.2. ➢ Location of radiation monitor is shown in Figure 11.5-1i and 11.5-2c.
436-3267	2	**Revise the Subsection 10.4.2 of DCD to reflect the response to RAI 246-2177 Question 10.4.2-1**	➢ DCD has already been revised.

10.4.3 Gland Seal System (GSS)

- The GSS is a non safety-related system.
- The GSS prevents air leakage into and steam leakage out of the casing of the steam turbine.
- Sealing steam is supplied to the turbine shaft from either the Auxiliary Steam Supply System (ASSS) or the MSS.
- The system returns the steam-air mixture from the turbine glands to the gland steam condenser and exhausts non-condensable gases into the atmosphere.



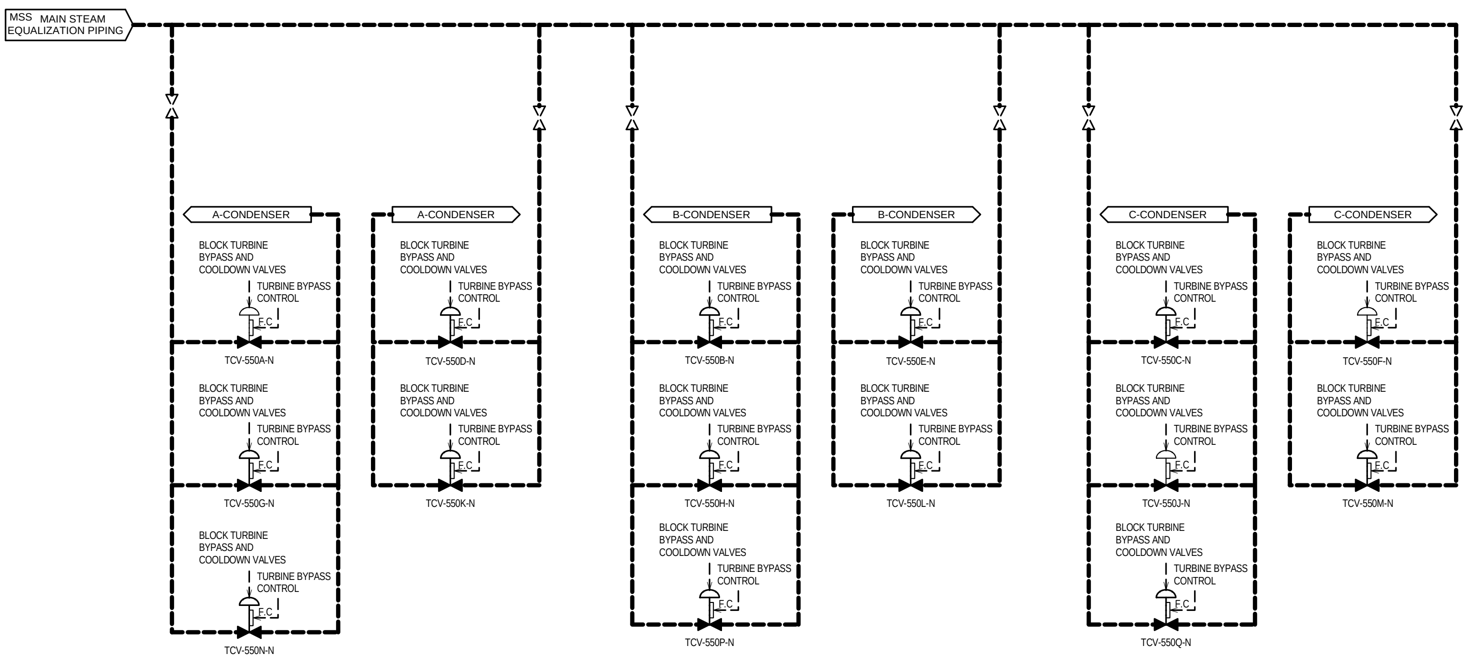
10.4.3 Gland Seal System (GSS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.03-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
236-2140	1	**Operating procedure for control release of radioactive materials**	➢ The operating procedure is addressed in Subsection 11.5.2.4.3.
437-3268	2	**Revise the Subsection 10.4.3 of DCD to reflect the response to RAI 236-2140 Question 10.4.3-1**	➢ DCD has already been revised.

10.4.4 Turbine Bypass System (TBS)

- The TBS is a non safety-related system.
- The TBS is part of the MSS and provides the capability to send the main steam flow from the SGs to the main condenser bypassing the main turbine
- The TBS with the capacity of 68 % rated steam flow rate is designed to sustain a 100% load rejection without reactor trip and without requiring actuation of the main steam relief valves, main steam safety valves or pressurizer safety valves



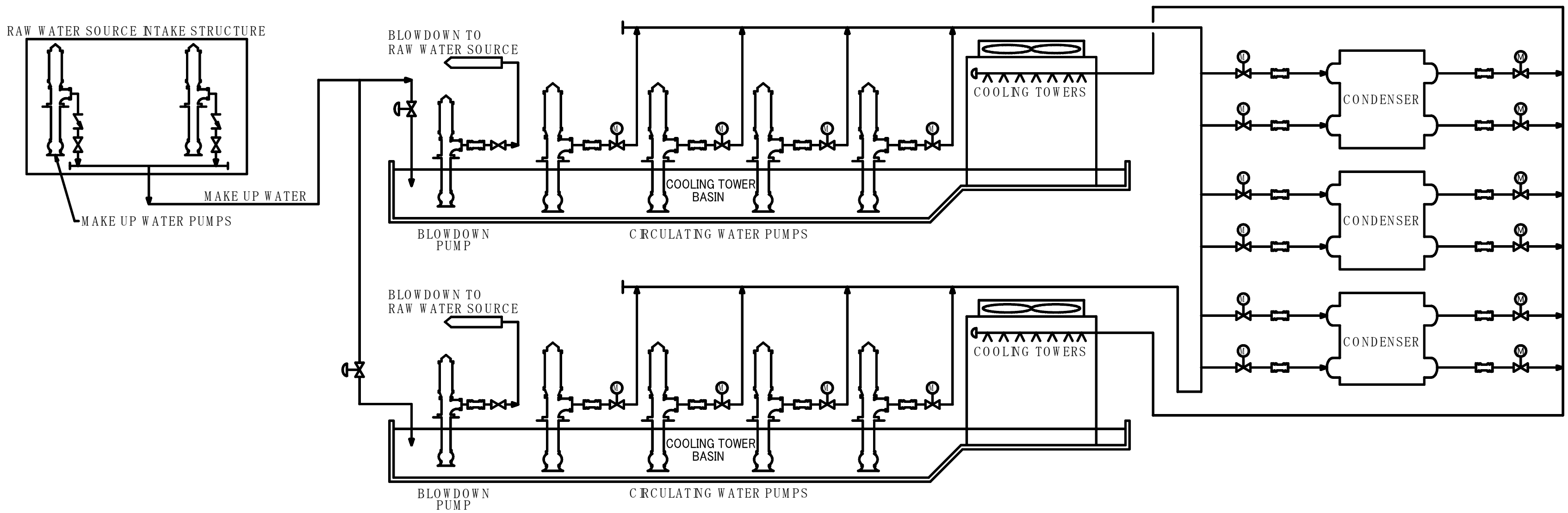
10.4.4 Turbine Bypass System (TBS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.04-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
159-1955	1	-TBS capacity for the maximum step changes requirements in terms of percentage of the main steam	➢ MHI provided: ✓ TBS has a capacity of 68 % of the rated power main steam flow ✓ TBS is designed to accommodate the maximum 100 % step change of electric load without a reactor or turbine trip and w/o the actuation of the MSRVs ✓ Three TBVs with 13.6 % of rated main steam flow perform adequate decay heat removal to keep the cooldown rate of RCS at 50 degF per hour during normal plant shutdown

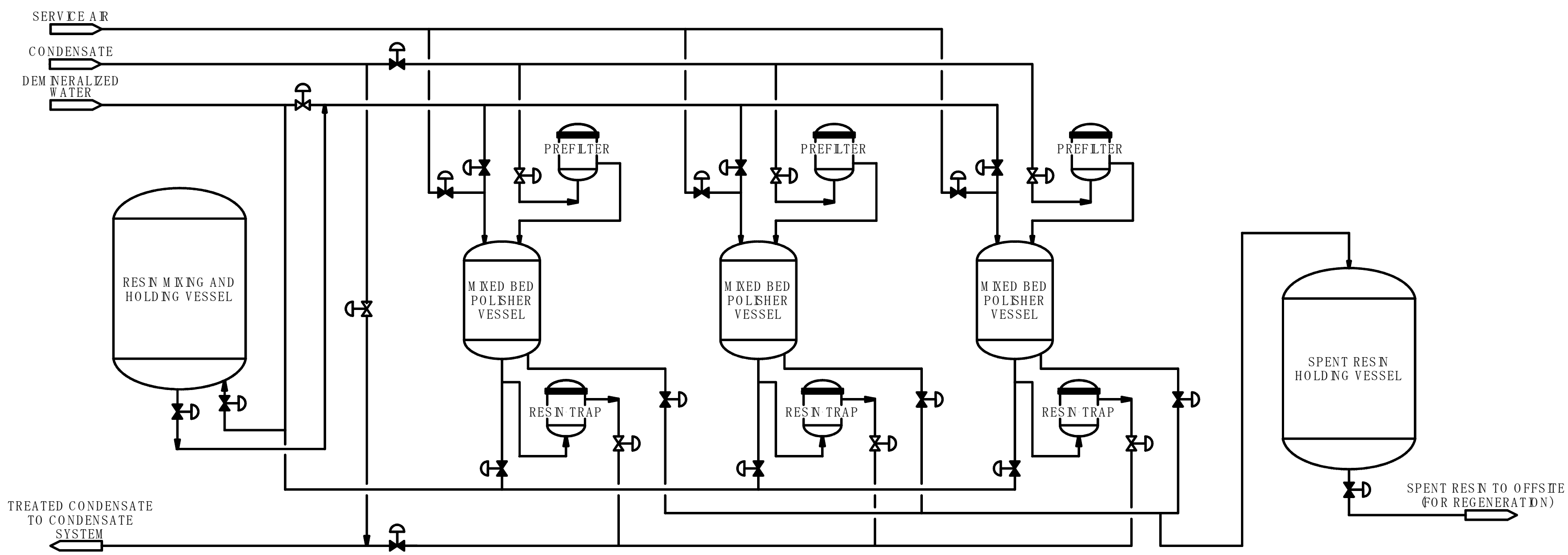
10.4.5 Circulating Water System (CWS)

- The CWS is a non safety-related system.
- The CWS supplies cooling water to remove the heat from the main condensers under various plant operating conditions and site environmental conditions.
- The CWS removes the plant heat during startup, normal operation, shutdown, transient condition, or turbine trip.
- No RAIs were issued on this subsection.



10.4.6 Condensate Polishing System (CPS)

- The CPS is a non safety-related system.
- The CPS is designed to remove dissolved ionic solids and impurities from the condensate and assists in the removal of corrosion products.



10.4.6 Condensate Polishing System (CPS)

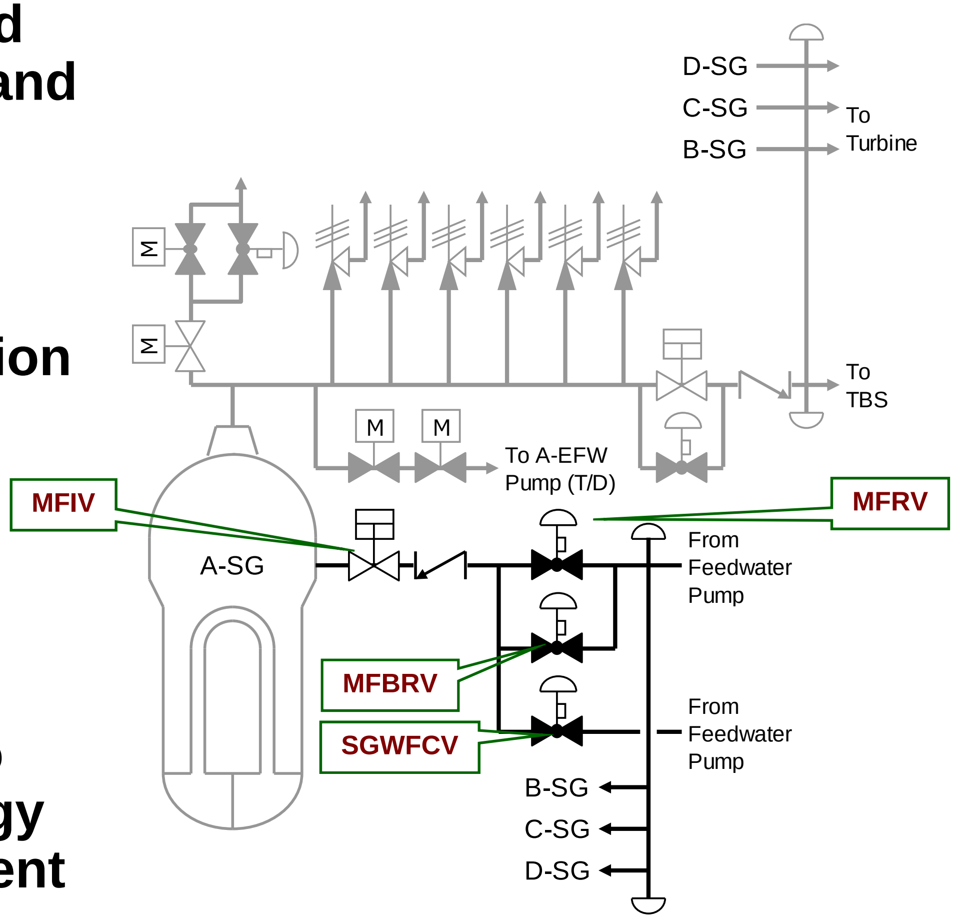
➢ Major RAIs (closed)

RAI No.	Question 10.04.06-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
630-5044	16	Water Chemistry (follow-up of RAI 441 and RAI 543)	The secondary water chemistry guideline for US-APWR is based on an EPRI “PWR Secondary Water Chemistry Guidelines”. • DCD Impact: Revise chapter 10.3.5.5, 10.3.5.6, 10.3.5.7 and 10.4.6.2.1 in DCD, and delete Table 10.3.5-1, 10.3.5-2, 10.3.5-3 and10.4.6-2.

➢ **All RAIs relating to water chemistry have been closed by RAI 630-5044.**

10.4.7 Condensate and Feedwater System (CFS)

- **The CFS provides feedwater at the required temperature, pressure, and flow rate to the SGs by MFRV, MFBRV and SGWFCV**
- **The safety-related function of the CFS is to provide C/V and feedwater isolation following a design basis accident such as MSLB/FLB**
- **Also, the MFIVs close to limit the mass and energy release to the containment as a safety function**



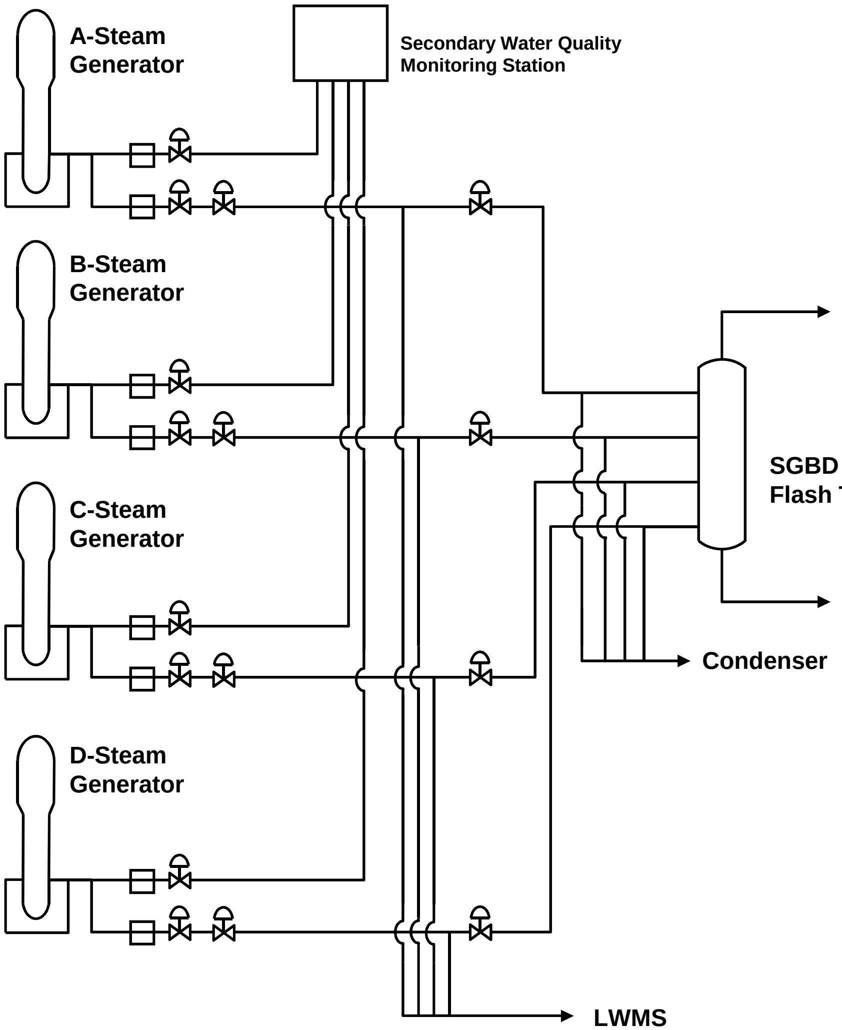
10.4.7 Condensate and Feedwater System (CFS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.07-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
124-1638	1	-COL item to provide operating and maintenance procedures to address water hammer issue	➢ MHI provided: ✓ Adding COL item 10.4(6), requiring COL applicants to develop operating and maintenance procedures for the CFS to aid in reducing the frequency of water hammer events

10.4.8 Steam Generator Blowdown System (SGBDS)

- The SGBDS assists in maintaining secondary side water chemistry within acceptable limits during normal operation and during anticipated operational occurrences due to main condenser tube leakage or primary to secondary steam generator tube leakage
- The SGBDS has a safety-related function to isolate the secondary side of the SGs using two isolation valves in series in the blowdown line from each SG. This provides a heat sink for a safe shutdown or to mitigate the consequences of a design basis accident with EFW actuation.
- Also, the SGBDS provides a containment isolation in each blowdown line from the SGs.



10.4.8 Steam Generator Blowdown System (SGBDS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.08-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
251-2146	1	To provide a concept of peripheral blowdown and more specific information about the location of the blowdown nozzle.	US-APWR has a peripheral blowdown system design with the nozzle located about seven inches below the top of the tubesheet in the bottom of a peripheral groove.
251-2146	3	To identify the differences about sampling requirement for SGBD water between DCD requirements and the EPRI secondary water chemistry guidelines.	The detail of this issue were reviewed by NRC mainly under SRP section 10.4.6, "Condensate Cleanup System". There is no impact on DCD.
251-2146	5	To describe how the blowdown demineralizers can remove contaminants from condenser tube leak and radioactivity from primary-to-secondary SG tube leakage.	To clarify that the CPS maintains condensate water quality in the case of a condenser tube leak, but the SDBD demineralizers support purification by the CPS.

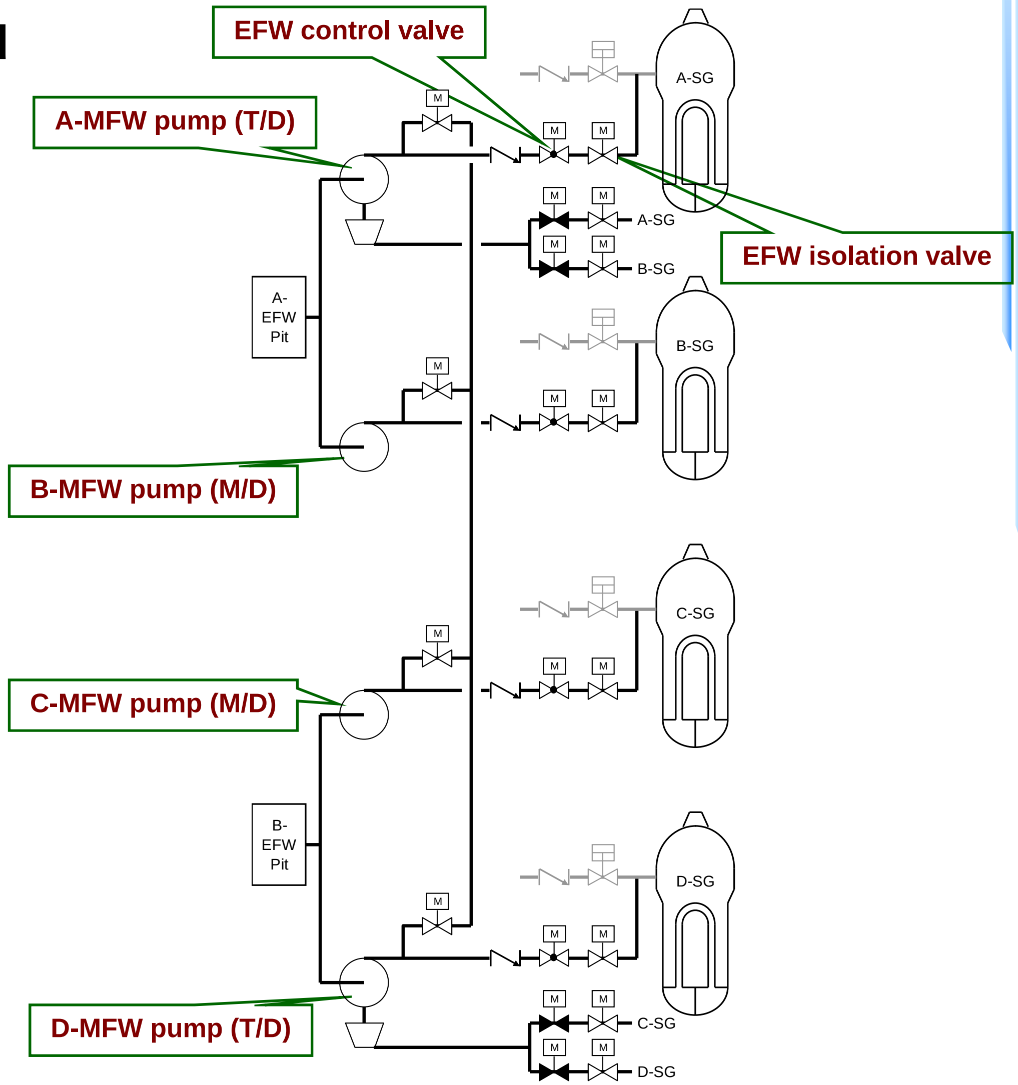
10.4.8 Steam Generator Blowdown System (SGBDS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.08-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
251-2146	7	To discuss how the system is designed to prevent FAC or describe the controls in place to ensure it is included in COL applicants' FAC programs.	The system is designed to preclude FAC in most locations through the use of low alloy steel and stainless steel in most portions of the system. In portions less susceptible to FAC, where carbon steel may be used, FAC is addressed through water chemistry control and inclusion in the FAC monitoring program. The FAC monitoring program shall be provided by COL applicants according to COL information Item 10.3(1).

10.4.9 Emergency Feedwater System (EFWS)

- The EFWS is a safety-related system which supplies EFW to the SGs and remove reactor core decay heat and RCS sensible heat.
- The EFWS automatically actuates upon a receipt of EFW actuation signal.
- The EFWS consists of four 50 % capacity pumps (two motor-driven pumps, two turbine-driven pumps), two 50 % EFW pits.
- The EFWS automatically terminates EFW flow to prevent excessive flow to depressurized SG and to prevent overfilling.



10.4.9 Emergency Feedwater System (EFWS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.09-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
160-1848	14	-Could not find any information in the DCD to ensure that the COL applicant develops operating and maintenance procedure to address steam binding issues	➢ MHI provided: ✓ Revised to describe a restoration procedure for addressing situation where bypass leakage through EFW check valves is detected
160-1848	4	-How the procedure requirements to prevent or minimize water hammer will be included in the DCD, and how the lines will be maintained water-solid?	➢ MHI provided: ✓ Adding to the DCD a description of water hammer prevention and mitigation measures for the EFWS ✓ Adding a new COL item 10.4(6) requiring COL applicants to develop operating and maintenance procedures for the EFWS that address minimization of potential water hammer ✓ Revised DCD to describe a restoration procedure with water filling requirement prior to returning to service for addressing situations where bypass leakage through EFW check valves is detected

10.4.9 Emergency Feedwater System (EFWS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.09-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
160-1848	7	-Demonstrate how it will be assured that emergency procedures will be developed for switchover of water to the DWST	➢ MHI provided: ✓ Added a description regarding the switchover procedures to the DCD. ✓ Added the program for developing and implementing emergency operating procedures by means of COL item 13.5(6).
160-1848	20	-EFWS check valves with safety related function are not explicitly identified in the ITAAC shown in Table 2.7.1.11-5 of the Tier 1 DCD	➢ MHI provided: ✓ Revisions will be made to DCD Tier 1 to include check valves with an active safety function

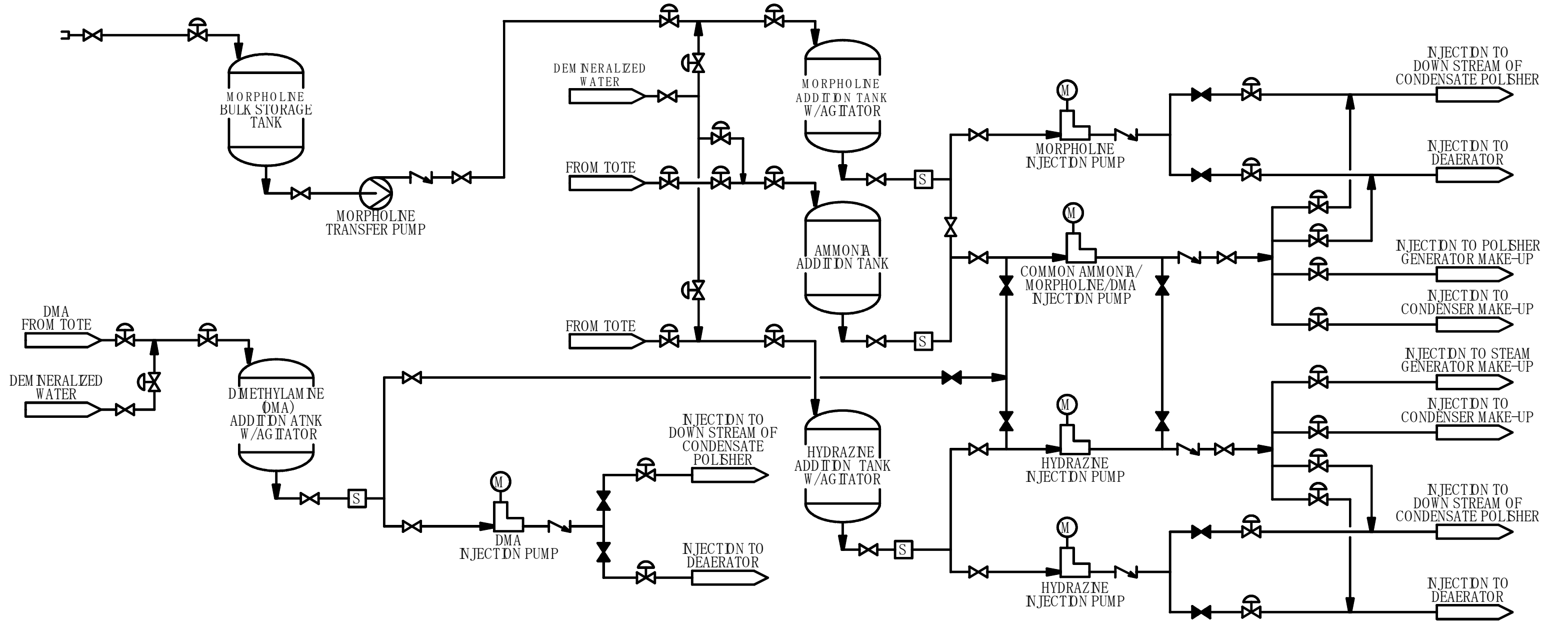
10.4.9 Emergency Feedwater System (EFWS)

➢ Major RAIs (closed)

RAI No.	Question 10.04.09-X	RAI Topic / NRC Concern	RAI Response / DCD Impact
160-1848	8	-Could not find in the DCD a statement regarding the amount of time that the turbine-driven EFWS pumps trains could supply flow to the plant in the absence of all ac power	➢ MHI provided: ✓ Turbine-driven EFWS pumps and associated valves are capable of operating from Class 1E batteries for at least two hours, except that ventilation for the pump rooms may be required after one hour of pump operation. Room cooling is provided by air handling units by a single unit of the AAC GTG system which will be started within one hour.
408-3170	24	-Design did not meet the criteria of GS-5, given that EFWS flow can be maintained during a SBO for only one hour without having to rely on ac power to provide pump room ventilation	➢ MHI provided: ✓ Making a reference to DCD Tier 2, Section 8.4.1.3, “Alternate AC Power Sources,” and its discussion regarding design features that limit CCFs between the AAC and onsite emergency power sources, therefore, AAC can be used during SBO.

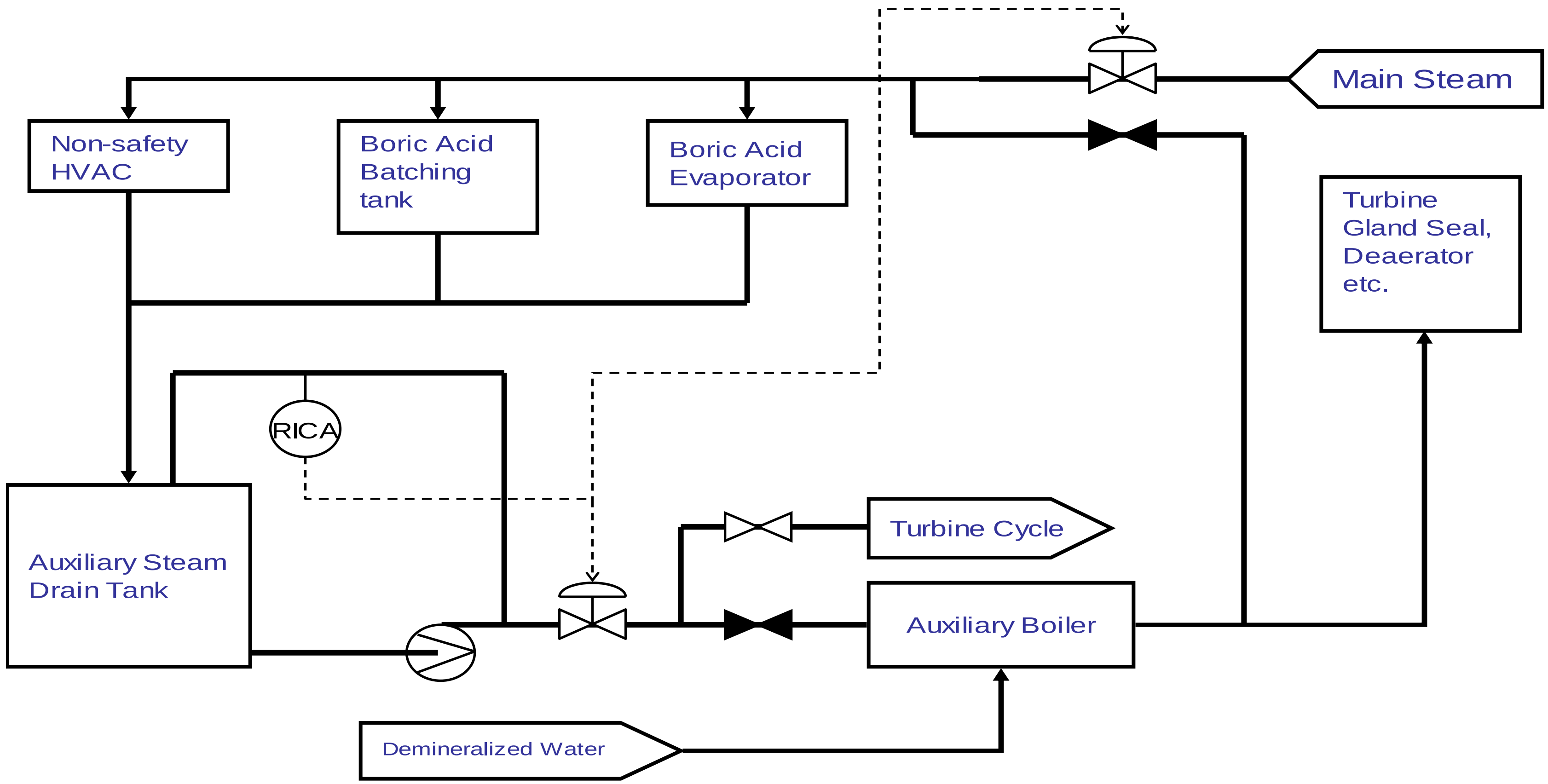
10.4.10 Secondary Side Chemical Injection System (SCIS)

- **The SCIS is a non safety-related system.**
- **The SCIS is designed to maintain a noncorrosive condition within the secondary loop.**
- **Noncorrosive condition is maintained by controlling pH and dissolved oxygen content in the secondary side by:**
  - ✓ Maintaining alkaline pH by morpholine, dimethylamine and ammonia injection
  - ✓ Scavenging dissolved oxygen with hydrazine injection
- **No RAIs were issued on this subsection.**



10.4.11 Auxiliary Steam Supply System (ASSS)

- The ASSS is a non safety-related system.
- The ASSS is designed to provide the steam required for plant use during plant startup, shutdown, and normal operation
- Steam is supplied from either the auxiliary boiler or the steam converter
- No RAIs were issued on this subsection.



Status Summary

- There are 3 Open Items discussed in this presentation and 5 Open Items total
- 1 Confirmatory Item has been addressed in DCD Revision 3
- 2 Remaining Confirmatory Items to be addressed in the next DCD Revision

United States Nuclear Regulatory Commission

Protecting People and the Environment

Presentation to the ACRS Subcommittee

Mitsubishi Heavy Industries (MHI)
US-APWR Design Certification Application Review

Safety Evaluation with Open Items: Chapter 10

STEAM AND POWER CONVERSION SYSTEM

AUGUST 17, 2011

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  Balance of Plant Systems Branch

Overview of Design Certification Application, Chapter 10

Section/Application Section		No. of Questions	Number of OI
10.02	Turbine Generator	4	1
10.02.03	Turbine Rotor Integrity	11	4
10.03	Main Steam Supply System	4	0
10.03.06	Steam and Feedwater System Materials	12	0
10.04.01	Main Condensers	2	0
10.04.02	Main Condenser Evacuation System	2	0

Overview of Design Certification Application, Chapter 10

SRP Section/Application Section		No. of Questions	Number of OI
10.04.03	Gland Seal System	2	0
10.04.04	Turbine Bypass System	2	0
10.04.05	Circulating Water System	0	0
10.04.06	Condensate Polishing System	16	0
10.04.07	Condensate and Feedwater System	1	0
10.04.08	Steam Generator Blowdown System	8	0

Overview of Design Certification Application, Chapter 10

SRP Section/Application Section		No. of Questions	Number of OI
10.04.09	Emergency Feedwater System	31	0
10.04.10	Secondary Side Chemical Injection System	0	0
10.04.11	Auxiliary Steam Supply System	0	0
Totals		95	5

Technical Topics
Section 10.2 – Turbine Generator

U.S.NRC
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Turbine Generator: Tier 1- ITAAC and Key Design Features

- **MHI provided Tier 1 - ITAAC and Key Design Features in Table 2.7.1.1-1 and Section 2.7.1.1.1 of the DCD**
  - In the process of its responses to RAIs: 10.2-4 and 14.03.07-51 and -52, MHI deleted turbine orientation and missile probability from the ITAAC Table 2.7.1.1-1
  - Also, MHI deleted Key Design Features from Tier 1 Section 2.7.1.1.1, which affected the staff evaluation of DCD Section 3.5.1.3
- **Open Item 10.2-1:**
  - In RAI 5910, Question 14.3.7, the staff requested to include the TG orientation and missile probability in Table 2.7.1.1-1, and also to include Key Design Features in Section 2.7.1.1.1, from Revision 2 of the DCD

Turbine Rotor Material

- MHI provided material properties based on ASTM A470
    - The grade and classification of the material was deleted from Revision 2 of the DCD
    - Mechanical testing in accordance with ASTM A370
- **Open Item 10.02.03-1** (RAI 4633, Question 10.02.03-8):
    - include in the DCD the grade and classification or reference to the specific ordering requirements that are bounded by the turbine missile analysis
- **Open Item 10.02.03-2** (RAI 4633, Questions 10.02.03-9):
    - Include the number of specimens to be tested and discuss why the specified 50% FATT and Charpy V-notch energy ensures adequate fracture toughness
- **Open Item 10.02.03-3** (RAI 4633, Question 10.02.03-10):
    - Include the method of obtaining the fracture toughness

Turbine Rotor Operating Experience and Inspection

- MHI provided criteria for Solid rotors
  - Visual, surface and volumetric inspections
  - 10 years inservice inspection interval

- **Open Item 10.02.03-4** (RAI 4633, Question 10.02.03-11):
  - Provide operating experience of solid (non-bored) rotors and whether internal defects of the as-built rotors can be detected and whether internal material properties can be determined

ACRONYMS

ASTM – American Society for Testing Materials

10 CFR – Title 10 of the Code of Federal Regulations

COL – Combined License

FATT – Fracture Appearance Transition Temperatures

FSAR – Final Safety Analysis Report

ITAAC – Inspections, Tests, Analyses, and Acceptance Criteria

PWR – Pressurized Water Reactor

RAI – Request for Additional Information

RG – Regulatory Guide

SER – Safety Evaluation Report

SRP – Standard Review Plan

TG – Turbine Generator

LUMINANT GENERATION COMPANY

Comanche Peak Nuclear Power Plant, Units 3 and 4

ACRS US-APWR Subcommittee

FSAR Chapter 10 – Steam and Power Conversion System

August 17, 2011

Agenda

- Introduction
- Subsection by Subsection Discussion
  - FSAR Summary – COL Items, departures
  - SER Summary – Open Items, Confirmatory Items, proposed License Conditions
  - Site-specific aspects
- Summary

Introduction

- FSAR uses "Incorporated by Reference" methodology
- No departures from US-APWR DCD
- No SER Open or Confirmatory Items
- One proposed License Condition
- No contentions pending before ASLB

10.1 Summary Description

- CPNPP FSAR Summary
  - US-APWR DCD incorporated by reference
  - No departures or supplements
  - No COL Information Items
- NRC SER Summary
  - No Open Items or Confirmatory Items
  - No proposed License Conditions

10.2 Turbine-Generator (T/G)

- CPNPP FSAR Summary
  - US-APWR DCD incorporated by reference
  - No departures
  - One COL Information Item – addressed in FSAR
- NRC SER Summary
  - No Open Items or Confirmatory Items
  - One proposed License Condition – T/G inspection program

10.3 Main Steam Supply System

- CPNPP FSAR Summary
  - US-APWR DCD incorporated by reference
  - No departures
  - Two COL Information Items – both addressed in FSAR
- NRC SER Summary
  - No Open Items or Confirmatory Items
  - No proposed License Conditions

10.3 Main Steam Supply System (cont'd)

- **Site-Specific Aspects**
  - **Flow-Accelerated Corrosion Monitoring Program**
    - Addresses GL 89-08
    - Consistent with NSAC-202L-R2
    - Will be established before fuel load with governing procedure and implementing procedures
    - Will be updated periodically to include industry experience

10.4 Other Features of Steam and Power Conversion System

- **CPNPP FSAR Summary**
  - US-APWR DCD incorporated by reference
  - No departures
  - Four COL Information Items – all addressed in FSAR

- **NRC SER Summary**
  - No Open Items or Confirmatory Items
  - No proposed License Conditions

10.4 Other Features (cont'd)

- **Site-Specific Aspects**
  - **Circulating Water System**
    - Makeup/blowdown from/to Lake Granbury 7 miles away
    - Makeup water intake structure screens limit intake velocity to 0.5 fps
    - Two 50% makeup water pumps per unit and common spare housed in makeup water intake structure
    - Blowdown by gravity drain with priming pump available
    - Blowdown treated by filtration, reverse osmosis, and evaporation as necessary to meet water permit

10.4 Other Features (cont'd)

- Site-Specific Aspects (cont'd)
  - **SG Blowdown System**
    - Startup BD rate is ~3% MSR
    - Normal operation BD rate is $\leq$1% MSR
    - Rad monitor downstream of SGBD HX
    - Cooled BD goes to existing waste management pond
    - Single-wall stainless and double-wall carbon piping used in different parts of system (RG 4.21)

Summary

- US-APWR DCD incorporated by reference
- No departures
- All COL Information Items addressed in FSAR Chapter 10
- No SER Open Items or Confirmatory Items
- One proposed License Condition

Acronyms

ASLB	Atomic Safety and Licensing Board
COLA	Combined License Application
CPNPP	Comanche Peak Nuclear Power Plant
CWS	Circulating Water System
DCD	Design Control Document
FSAR	Final Safety Analysis Report
HX	Heat Exchanger
MSR	Maximum Steaming Rate
R-COLA	Reference COLA
RG	Regulatory Guide
SER	Safety Evaluation Report
SGBD	Steam Generator Blowdown

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Presentation to the ACRS Subcommittee

Comanche Peak Nuclear Power Plant, Units 3 and 4
COL Application Review

Safety Evaluation Report

CHAPTER 10: Steam and Power Conversion System

August 17, 2011

Staff's Presentation Order

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

- **Stephen Monarque** - Comanche Peak COLA Lead Project Manager

- **Paul Kallan -** Project Manager

Technical Review Team

- **Robert Davis**
  Component Integrity Branch
- **Gregory Makar**
  Component Integrity Branch
- **John Honcharik**
  Component Integrity Branch
- **Eduardo Sastre**
  Component Integrity Branch
- **Devender Reddy**
  Balance of Plant Systems Branch
- **Angelo Stubbs**
  Balance of Plant Systems Branch
- **Tarico Sweat**
  Balance of Plant Systems Branch
- **Joshua Wilson**
  Balance of Plant Systems Branch

Overview of COLA Review

SRP Section/Application Section		No. of Questions	Number of OI
10.1	Summary Description	0	0
10.2.3	Turbine Generator	2	0
10.3	Main Steam Supply System	1	0
10.3.4.1	Steam and Feedwater System Materials	3	0
10.3.4.2	Water Hammer Prevention in the Steeam and Feedwater Systems	0	0
10.4	Other Features of the Steam and Power Conversion Systems	0	0
10.4.1	Main Condensers	0	0
10.4.2	Main Condenser Evacuation System	0	0

Overview of COLA Review (continued)

SRP Section/Application Section		No. of Questions	Number of OI
10.4.3	Gland Seal System	0	0
10.4.4	Turbine Bypass System	0	0
10.4.5	Circulating Water Systems	0	0
10.4.6	Condensate Polishing System	0	0
10.4.7	Condensate and Feedwater System	0	0
10.4.8	Steam Generator Blowdown System	2	0
10.4.9	Emergency Feedwater System	0	0
10.4.10	Secondary-Side Chemical Injection System	0	0
10.4.11	Auxiliary Steam Supply System	0	0
Totals		**8**	**0**

Acronyms

U.S.NRC
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- COL – combined license
- COLA – combined license application
- DBA – design basis accident
- FSAR – Final Safety Analysis Report
- GDC – General Design Criteria
- IBR – incorporated by reference
- SER – Safety Evaluation Report
- RAI – request for additional information
- RCOL – reference combined license

LUMINANT GENERATION COMPANY

Comanche Peak Nuclear Power Plant, Units 3 and 4

ACRS, US-APWR Subcommittee

FSAR Chapter 8 – Electric Power

August 17, 2011

Agenda – FSAR Chapter 8, Electric Power

- Introduction
- Subsection by Subsection Discussion
  - FSAR Summary – Site Specific Design, COL Items, Departures
  - SER Summary – Open Items, Confirmatory Items, Proposed License Conditions
- Summary

Introduction

- R-COLA authored using "Incorporated by Reference" methodology
- CPNPP COLA FSAR Chapter 8 takes no departures from the US-APWR DCD
- All site-specific SER Open Items have been addressed
- All site-specific Confirmatory Items have been addressed and are in FSAR Revision 2 submitted in June 2011
- COLA Revision 3 is scheduled for June 2012
- No contentions pending before ASLB

8.1 Introduction

- **CPNPP COLA FSAR Summary**
  - US-APWR DCD Incorporated by Reference
  - No departures or supplements
  - No COL Information Items

- **NRC SER Summary**
  - 1 site-specific SER Open Item (08.01-1) related to effects of shared electrical equipment between plants on safe shutdown
  - No Confirmatory Items
  - No proposed License Conditions

08.01-1 Sharing of SSCs (Open Item)

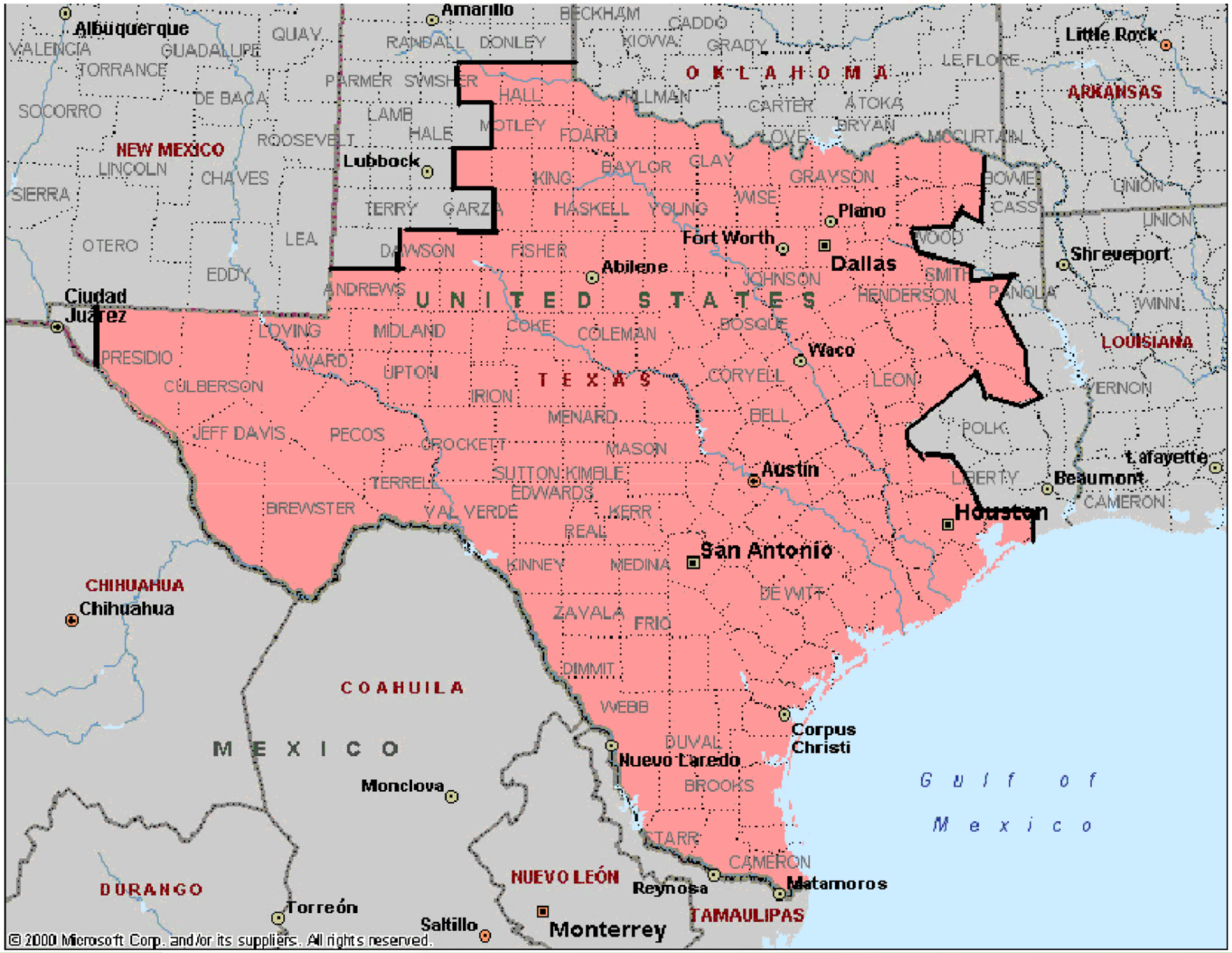
- **Open Item 08.01-1 related to CP RAI 9 (RAI 2576) Question 08.01-2**
  - **"However, the applicant has not demonstrated whether or not the SSCs important to safety that are shared among nuclear power units will not significantly impair their ability to perform their safety functions, including an accident in one unit, and orderly shutdown and cooldown of the remaining units."**
  - **Luminant has recently submitted supplemental information to address this Open Item and the response is under NRC Staff review.**

Luminant

US-APWR

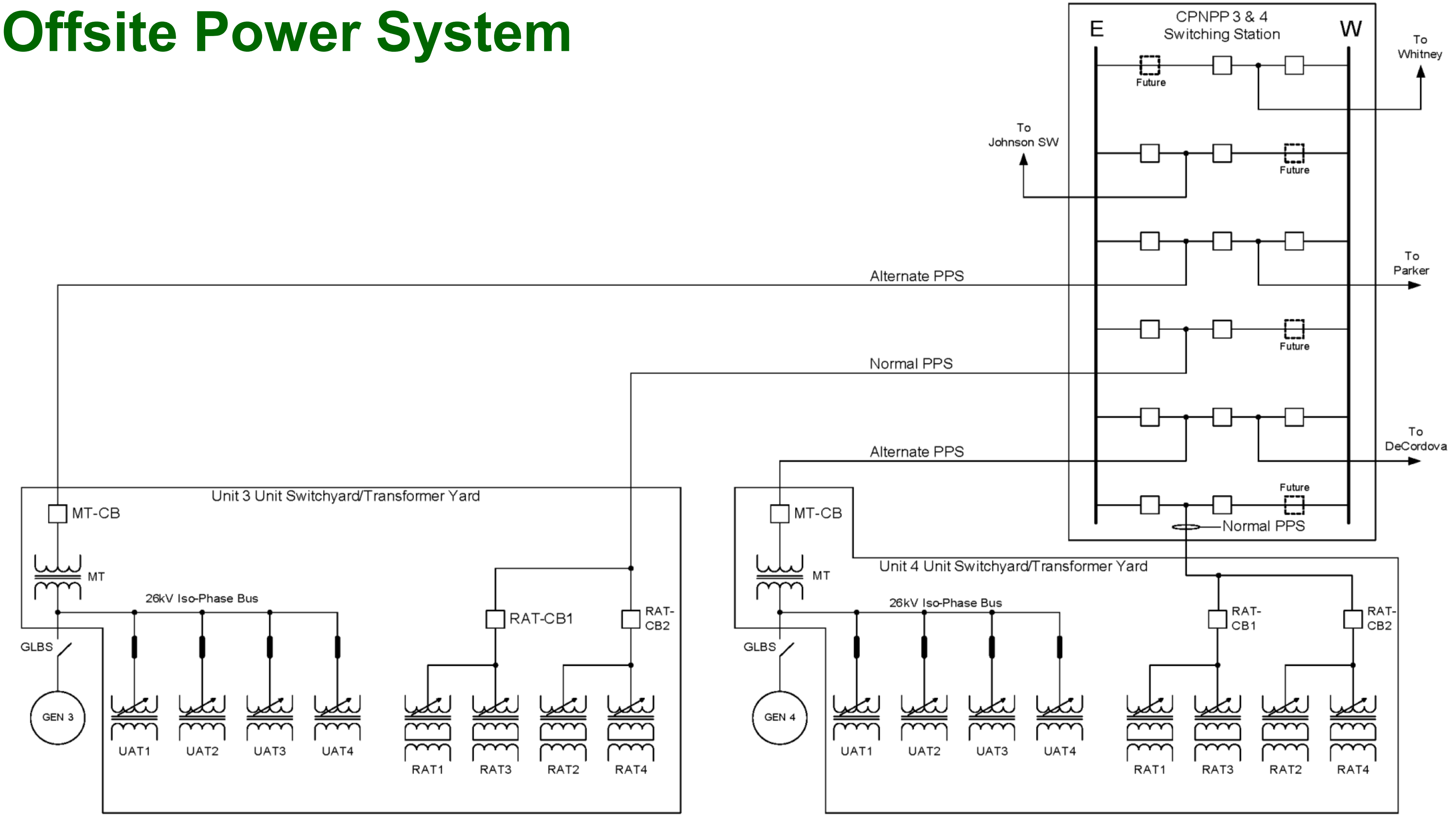
MNES
MITSUBISHI NUCLEAR ENERGY SYSTEMS, INC.

8.2 Offsite Power System



Luminant US-APWR MNES MITSUBISHI NUCLEAR ENERGY SYSTEMS, INC.

8.2 Offsite Power System



8.2 Offsite Power System

- CPNPP COLA FSAR Summary
  - US-APWR DCD Incorporated by Reference
  - No departures
  - Nine COL Information Items
- NRC SER Summary
  - 1 SER Open Item (08.02-1) related to anti-motoring time delay
  - Three Confirmatory Items
  - No proposed License Conditions

08.02-1 Anti-motoring time delay (Open Item)

- **Open Item 08.02-1, related to CP RAI 182 (RAI 5116) Question 08.02-30 and DCD RAI 687 (RAI 5394) Question 15.0.0-24**
  - **"Inconsistency between the DCD chapter 15 language related to anti-monitoring protective relaying for main generator output breaker."**
  - **The Staff is working on resolution with the DCD applicant, once a resolution is reached, Luminant will either confirm or revise its response to question 08.02-30.**

8.3 Onsite Power Systems

- **CPNPP COLA FSAR Summary**
  - US-APWR DCD Incorporated by Reference
  - No departures
  - Seven COL Information Items
- **NRC SER Summary**
  - No SER Open Items
  - One Confirmatory Item
  - No proposed License Conditions

8.4 Station Blackout

- **CPNPP COLA FSAR Summary**
  - **US-APWR DCD Incorporated by Reference**
  - **No departures**
  - **No COL Information Items**

- **NRC SER Summary**
  - **No SER Open Items**
  - **One Confirmatory Item**
  - **No proposed License Conditions**

Summary

- COL Information Items are addressed in FSAR Chapter 8
- No departures
- All site-specific SER Open Items have been addressed
- All RAI responses associated with site-specific confirmatory items were addressed in COLA Revision 2
- No proposed license conditions

Acronyms

ACRS	Advisory Committee on Reactor Safeguards
ASLB	Atomic Safety and Licensing Board
COL	Combined license
COLA	COL application
CPNPP	Comanche Peak Nuclear Power Plant
DCD	Design control document
FSAR	Final Safety Analysis Report
LC	License condition
OI	Open item
RAI	Request for Additional Information
R-COLA	Reference COLA
SER	Safety Evaluation Report

Presentation to the ACRS Subcommittee

Comanche Peak Nuclear Power Plant, Units 3 and 4
COL Application Review

Safety Evaluation Report

CHAPTER 8: ELECTRIC POWER

August 17, 2011

Staff's Presentation Order

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

- **Stephen Monarque** - Comanche Peak COLA Lead Project Manager
- **Ngola Otto -** Project Manager
- **Tania Martinez Navedo-** Technical Staff Presenter

Overview of COLA Review

SRP Section/Application Section		No. of Questions	Number of OI
8.1	Introduction	2	1
8.2	Offsite Power System	30	1
8.3.1	Onsite Power System	1	0
8.3.2	DC Power System	0	0
8.4	Station Blackout	3	0
Totals		**36**	**2**

Section 8.1 Electric Power Introduction

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- ***Open Item No. 08.01-1 (RAI 2576, Question 08.01-2)***

    - COL Information Item No. 8.2(3) – switchyard description

    - Issue:
        - GDC 5 is applicable to Comanche Peak because its switchyard is shared between 2 units.
        - COL applicant was requested to address how it meets GDC 5, in terms of the capacity of the transmission lines and switchyard components to support loads in the event of an accident in one unit and safe shutdown of the adjacent unit.

- Supplemental Response to RAI 2576, Question 08.01-2 was submitted and is under Staff review.

Section 8.2
Offsite Power System

U.S.NRC
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- ***Open Item No. 08.02-1 (RAI 5116, Question 08.02-30)***
  - COL Information Item No. 8.2(11) – Offsite power stability studies
  - Issue:
    - The Comanche Peak FSAR language is not consistent with the DCD language with respect to the 3-second time delay after a turbine trip to maintain adequate voltage to the Reactor Coolant Pumps in the following area:
      - The DCD states that the main generator breaker is opened by the turbine trip signal after a time delay of 15-seconds
      - The Comanche Peak FSAR states that the main generator breaker is opened by a reverse power relay after a time delay of 15-seconds
- Subsequently, the NRC staff has requested the DCD applicant to clarify the language in the DCD to eliminate the inconsistency between the two documents.

Acronyms

- COL – combined license
- COLA – combined license application
- DBA – design basis accident
- FSAR – Final Safety Analysis Report
- GDC – General Design Criteria
- IBR – incorporated by reference
- SER – Safety Evaluation Report
- RAI – request for additional information
- RCOL – reference combined license