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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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ABWR SUBCOMMITTEE

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WEDNESDAY

DECEMBER 3, 2014

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 1:30 p.m., Michael L. Corradini, Chairman, presiding.

COMMITTEE MEMBERS:

MICHAEL L. CORRADINI, Subcommittee Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

DANA A. POWERS, Member

HAROLD B. RAY, Member
JOY L. REMPE, Member
PETER C. RICCARDELLA, Member
MICHAEL T. RYAN, Member
JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:
MAITRI BANERJEE
QUYNH NGUYEN

ALSO PRESENT:
DENNIS ANDRUKAT, NRO
LUIS BETANCOURT, NRO
ERIC BOWMAN, NRR
ROCKY FOSTER, NRO
JAMES M. GILMER, NRO
EVANS HEACOCK, NINA
SCOTT HEAD, NINA
TIM HIRST, Hirst Engineering
CHANG LI, NRO
SAMUEL LEE, NRO
TANIA MARTINEZ-NAVEDO, NRR
BILL MOOKHOEK, NINA
THOMAS SCARBROUGH, NRO

DINESH TANEJA, NRO
STEVE THOMAS, NINA
JIM TOMKINS, NINA
HANRY WAGAGE, NRO

T A B L E   O F   C O N T E N T S

P R O C E E D I N G S

1:30 p.m.

CHAIRMAN CORRADINI: Okay. Why don't we begin. This meeting will come to order. This is a meeting of the Advance Boiling Water Reactor, ABWR, Subcommittee for the ACRS. My name is Mike Corradini. I am chair of the Subcommittee.

ACRS members currently in attendance are Pete Riccardella, Harold Ray, Dana Powers, Dennis Bley, John Stetkar, Mike Ryan, Charlie Brown, Joy Rempe and Ryan Ballinger. We also have Mr. Quynn Nguyen as our designated federal official for the meeting.

As announced in the Federal Register on November 26, 2014, the subject of today's briefing is the COL application submitted by Nuclear Innovation of North America, or NINA, for the South Texas Project, Units 3 and 4 and the staff's final Safety Evaluation Report related to the requirements resulting from the Fukushima Near Term Task Force Recommendation 4.2, Mitigating Strategies.

The briefing will also include the NRO staff responding to a question from the Committee members regarding the possibility of spurious signals from digital I&C cabinets with fiberoptic cables under heat from a nearby fire.

The rules for participation in today’s meeting were announced in the Federal Register Notice on November 26th that stated that portions of the meeting could be closed to the public to discuss proprietary information.

However, since then the staff has informed us that the entire meeting could be open to the public I should say would be open to the public.

We have a telephone bridge line for the public and stakeholders to hear the deliberations. To minimize disturbances, the line will be kept in the listen-only mode until the end of the meeting when we will provide 10 minutes for public comment.

At that time, any member of the public attending the meeting in person or through the bridge line can make a statement or provide comments as desired.

We'll check on that as we get closer to the end of the meeting to see if there are any members of the public on the line.

As the meeting is transcribed, I request that the participants in this meeting use the microphones located throughout the room when addressing the Subcommittee.

Participants should first identify

themselves and speak with sufficient clarity and volume so that they can be readily heard.

And then, please silence all cell phones, pagers, iPhones, iPads, Kindles, Fires and all appropriate appliances, washers and dryers.

We will now proceed with the meeting. I'll call upon Rocky Foster. Is Rocky --, there you are. Sorry, Rocky. I didn't see you hiding over there.

NRO can begin their presentation.

MR. LEE: I'll pinch hit for Rocky. My name is Sam Lee. I'm the Chief of Licensing, Branch 2 in Office of New Reactors.

I just wanted to take the opportunity to appreciate the Committee for this time and opportunity to brief you on mitigating strategies.

I just wanted to make a note here that this is the last of the scheduled ACRS briefings for our South Texas Project COLA 3 and 4. So, we look forward to this opportunity and I'll turn it over to the applicant.

MEMBER POWERS: There is a very optimistic individual over there.

(Laughter.)

MR. LEE: I did say last of the scheduled meetings.

MEMBER POWERS: Oh, I see.

CHAIRMAN CORRADINI: So, I should have interjected earlier with one comment that given the fact this is the last planned subcommittee meeting, we'll in the wrap-up here probably not only discuss our comments relative to the subjects of today, but also make sure we're on track for a potential committee letter in February.

Scott, I think you're going to start us off.

MR. HEAD: Yes, sir. Just I would like to add one thing to your discussion. You said the staff is going to brief you on the Open Item 64.

I think we would like an opportunity to offer a briefing on that topic.

CHAIRMAN CORRADINI: Oh, yes. I'm sorry. That is my mistake. You're on the schedule as well as the staff. Go ahead.

MR. HEAD: All right. And I also appreciate the opportunity to brief the ACRS today on Recommendation 4.2.

Attendees today, myself and obviously Steve Thomas, the engineering managers, briefed you on a number of topics before.

Bill Mookhoek, our licensing supervisor, has been here at our meetings before. He will be -- his main focus today will be FLEX.

And as a former shift supervisor at Units 1 and 2, the operational aspect of all that, I think it will be a worthwhile discussion today that we have regarding that.

Jim Tomkins, Dick Scheide and Evans Heacock, Evans has briefed you on a number of topics with respect to electrical aspects of the design and obviously is available to discuss that with respect to this topics, too.

So, our agenda, I'm going to just slide back around on the regulatory framework. And then Steve is going to go into the, you know, basically the DCD features that mitigate a station blackout, the ones that -- the features that were there that came with the certified design.

And he'll also go into the enhancements to address the NRC Fukushima recommendations that we've committed to in the COLA.

And then Bill, as I alluded to, will go through the FLEX plan, sequence of events and how we're addressing the FLEX requirements. Short discussion on supporting analysis, the summary and conclusions. So, that's the agenda for the day.

Just as background, actions have been identified in response to the Fukushima event. We have embarked on doing that.

Four actions apply to new reactors. We briefed the ACRS on the -- on 2.1, 7.1 and 9.3 early in the year.

All these actions are laid out in our Appendix 1E in the COLA to describe, you know, how we're reacting to all of those, which references a FLEX plan. And today we're going to be covering 4.2.

If no questions for me with that background, I'm going to turn it over to Steve Thomas.

MR. THOMAS: Okay. Thanks, Scott.

As Scott mentioned, before Fukushima and before FLEX, station blackout was a major design consideration in the development of the certified design for the ABWR.

ABWR incorporates major installed capability for station blackout mitigation. Those components are highlighted here.

We have a combustion turbine generator --

MEMBER STETKAR: Let me -- I was going to ask Scott, but I might as well get this off my chest early.

MR. THOMAS: Okay.

MEMBER STETKAR: All of the Fukushima mitigation strategies are ostensibly designed to address beyond design-basis external events.

For South Texas, is a 0.2 g peak ground acceleration beyond design-basis earthquake, or a 0.4 g earthquake beyond design-basis?

Because you guys have two design bases. You've got the certified DCD design-basis peak ground acceleration of 0.3 g, and then you have your so-called site-specific design-basis of 0.13 g.

And I know what equipment is qualified to each. So, depending on how I ask questions over the next three-and-a-half hours, I need to understand what for you is a beyond design-basis earthquake.

MR. THOMAS: Want me to answer that?

MEMBER STETKAR: Yes.

(Laughter.)

MEMBER STETKAR: Somebody answer that.

MR. THOMAS: I think most of the equipment we're going to be talking about is going to be protected against the site-specific conditions, which would be the .13 g earthquake.

There are exceptions on here. Mainly, the reactor core isolation cooling system and any of the components in the Reactor Building are going to be qualified to the 0.3 g, but the non-safety-related equipment that we're going to be crediting in the FLEX plan will be qualified to the site-specific earthquake.

MEMBER STETKAR: Your diesel generators are qualified to 0.3 g, right?

MR. THOMAS: Yes, sir.

MEMBER STETKAR: Okay. So, we're talking about an earthquake that leaves essentially all of the certified design equipment intact because it's qualified for well above your site-specific, and, yet, leaves you with a station blackout where you require the stuff that's qualified for 0.13 g.

MR. THOMAS: That would be the presumption.

MEMBER STETKAR: Okay. Thank you.

CHAIRMAN CORRADINI: Besides the fact that it sounds inconsistent.

MEMBER STETKAR: Yes, but I just wanted to get it on the record that it doesn't --

CHAIRMAN CORRADINI: Are you going to come back to this? Because I have questions, too.

MEMBER STETKAR: Well, no, because depending on which -- I got the answer that I want, because depending on which questions I ask --

MR. HEAD: That answer works. I mean,

that's an appropriate, I mean, we've had two design bases, you know, depending on the different structures or features, and that's the way the plan --

MEMBER STETKAR: To me, quite honestly, it doesn't make any sense, but that's okay.

(Laughter.)

MR. HEAD: When you're making a decision in South Texas for a 0.3 g earthquake, there is some benefit to a --

MEMBER STETKAR: I'm sorry. For a 0.3 g earthquake, there's a fairly high likelihood that all of your stuff that's qualified for 0.13 g doesn't survive.

MR. HEAD: I understand.

MEMBER STETKAR: About a 40 percent chance that it doesn't survive.

MR. HEAD: But when you're making those original decisions, a 0.13 g earthquake is still very conservative, as we've demonstrated in our previous discussions.

MEMBER STETKAR: It's not my question. This is for beyond design-basis earthquakes. I don't think I'll comment on that any further.

MR. HEAD: Okay.

MEMBER POWERS: Well, I'll comment a little bit. I mean, it's also true that at a 0.6 g there's very low likelihood that the 0.3 g stuff --

MEMBER STETKAR: That's --

MEMBER POWERS: -- will survive.

MEMBER STETKAR: -- absolutely true, Dana, which is -- but I'm trying to get calibrated where the lower bound of what I'm thinking about is.

MEMBER POWERS: Well, it seems to me I would think about the more probable lower bound. What kind of earthquake are you likely to have?

MEMBER STETKAR: I've got the exceedance frequencies and I know what those are also.

MR. THOMAS: Thank you, Member Powers. That was my comment as well.

(Laughter.)

MEMBER POWERS: You can pay me right after the meeting.

MR. THOMAS: Okay.

CHAIRMAN CORRADINI: We'll go on, because I had similar questions about the different levels. But go ahead. I'm sorry.

MR. THOMAS: So, the ABWR in its inception for the certified design did consider station blackout as a major design consideration. And there was specific equipment designed for and installed in the plant to mitigate station blackout.

Those are listed here on the slide. I'll read them quickly. There's the combustion turbine generator.

We're going to mention the combustion turbine generator a couple times in this presentation. I guess I want to make it clear from the outset that we are not taking credit for the combustion turbine generator in our mitigating strategy plan.

It will be there. It's a significant piece of equipment for the site, significant piece of risk equipment at the site, but we are not taking credit for it in our FLEX strategy.

CHAIRMAN CORRADINI: You're not, okay. So, now we're into the questions I didn't understand from NEI.

You're not, or by staff guidance you can't?

MR. THOMAS: The NEI guidance at this point, requires you to assume that all installed AC power is unavailable --

CHAIRMAN CORRADINI: Okay.

MR. THOMAS: -- in the FLEX scenario.

CHAIRMAN CORRADINI: Okay. So, it's more a matter of -- okay. Then you can't.

MR. THOMAS: Under that guidance, that's

true.

CHAIRMAN CORRADINI: Under the postulated scenario.

MR. THOMAS: Maybe if we put wheels on it, we could take credit for it. But since it's installed, under those guidelines we cannot.

CHAIRMAN CORRADINI: Got it.

MR. THOMAS: And do not.

CHAIRMAN CORRADINI: Okay.

MR. THOMAS: The AC-independent water addition system, again, part of the original certified design.

This is essentially the diesel-powered fire pump and portions of the fire protection system to provide an alternate injection capability.

Reactor core isolation cooling, standard piece of equipment for the boiling water reactor. Give significant credit for this.

We have a somewhat unique reactor core isolation cooling turbine pump which I'll talk about a little bit later in the presentation.

Containment overpressurization system, COPS, part of the atmospheric control system, protection for the containment is basically the passive hardened vent system that you may have heard in some other discussions.

And we have substantial battery capacity. Four divisions of Class 1E batteries in the ABWR that we use in the FLEX strategy.

These provide us with substantial capability. I will point out, however, that these components were installed in the design, incorporated into the design before the Fukushima event, before NEI 12-06, but the NEI guidance created additional requirements in order to take credit for installed equipment in the plant.

And, therefore, we have made some enhancements to these components, which I'll discuss on the next several slides.

Again, I'm mentioning the combustion turbine generators that we don't take credit for. These were previously in the certified design flood protected components for the site flood.

We have in our application, committed to qualify these for the design-basis hurricane and tornado missiles that they might be subjected to. So, we're additionally providing additional qualification criteria for these components to protect them from external events.

The ACIWA system was seismically qualified in the certified design. And likewise, we are taking additional measures to flood protect these things and protect them from missiles and other severe weather external events.

MEMBER STETKAR: Steve, I couldn't find it easily. Good acronym, ACIWA. Is ACIWA qualified to 0.13 g, or 0.3 g, because it's not safety related.

MR. THOMAS: It is not. It will be qualified to the site-specific earthquake.

MEMBER STETKAR: 0.13 g, okay.

MR. THOMAS: Yes.

MEMBER STETKAR: Thanks.

MR. THOMAS: The ACIWA includes fire water storage tanks. Those will also be qualified for site-specific floods, missiles and external hazard events.

In the original design, only one of those tanks was protected, was seismically qualified. In our FLEX strategy, we are qualifying and protecting both of the fire water storage tanks for the system.

ACIWA will also be able to take suction from the ultimate heat sink, which is a very large inventory of available water, through the use of some connections that we are adding for that purpose.

CHAIRMAN CORRADINI: But just to clarify, it can be taking credit based on the rules of the game with B

MR. THOMAS: The inventory can be taking credit. If the inventory is protected, then you can take credit for that inventory water.

You cannot take credit for any of the active components, pumps, fans and things like that.

CHAIRMAN CORRADINI: Okay.

MEMBER STETKAR: It's also, though, the building and things are only protected to 0.13 g.

MR. THOMAS: Right.

MEMBER STETKAR: That is correct.

CHAIRMAN CORRADINI: Keep on going.

MR. THOMAS: We have made some additional enhancements to the spent fuel pool cooling system. Primarily in the original design, RHR Train Charlie, Train C, was a little bit -- did not have the same capabilities as A and B in terms of providing makeup to the spent fuel pool. So, we have made all three of those trains the same.

ACIWA ties into RHR Train C. And so, therefore, we can provide spent fuel pool makeup and other functions with RHR Train C the same as A and B.

MEMBER STETKAR: Steve, can you actually physically -- I got lost and I know the flow capacity of the pump.

Can you physically connect it to both units simultaneously?

MR. THOMAS: Yes.

MEMBER STETKAR: You can, okay. Thank you.

MR. THOMAS: There is substantial onsite storage of diesel fuel and water supplies. We have combined at both units about 1.7 million gallons of diesel fuel. The issue would be getting it in the right place, and we'll discuss that a little bit later.

Likewise, in counting the substantial volume in both of the alternate heat sink basins, we have about 35 million gallons of water available. Again, we need to get that to the right place, which we will discuss in a little bit more detail later.

The condensate storage tank is a major supply of water for the reactor core isolation cooling system. In the original design, the condensate storage tank was non-safety-related, not qualified.

We have committed to protect that structure for flood and external events such as tornado and hurricane missiles.

We're providing battery connections between the different battery banks, primarily between Battery Bank 2 and 3, which would give us the capability of accessing the battery -- stored battery power in all four trains of the Class 1E batteries.

We'll see later on that we really only need one of those trains to accomplish our coping strategy. So, we have substantial margin, which we'll talk about a little bit later. We have added a plant radiation monitor powered by 1E power to the plant stack.

Okay. We're adding permanent connections to allow offsite diesel generators to be connected in Phase III. This is a little bit confusing. I want to make sure that you didn't read this three phase.

The generators are three phased, but they will be utilized in Phase III --

MEMBER STETKAR: Do you know how many single-phase 480 volt stuff that you --

(Laughter.)

MR. THOMAS: I just want to make sure it is we're talking about utilizing these in Phase III of the mitigation strategy.

Internal radio communications are going to be powered by non-Class 1E batteries during the first 36 hours of the event.

We have other communications capabilities that we'll talk about if for some reason those are not available, but they are located in a Seismic Category structure and will be seismically mounted.

MEMBER STETKAR: Steve, while I've got you on this slide, why did you decide to only bring in 480 volt diesels and not 4 kV diesels?

Because with 4 kV diesels, I can get a whole lot of pumps that my operators are more used to using like residual heat removal available. With 480 volt, I can repower battery chargers and keep my single train of mitigation going.

So, I was curious why not -- as long as you're air lifting stuff in, why not air lift big diesels in that you have a lot more flexibility with.

MR. THOMAS: Because primarily the strategy, as you mentioned, is to recharge the batteries.

MEMBER STETKAR: Yes, but that's recharging the batteries presuming, according to the NEI rules, presuming that your one and only one set of equipment can never fail and runs infinitely.

With a big-guy diesel, I can power a whole bunch of things that give me many more options as an operator. And as long as I'm flying them in there, why not fly in a big diesel and hook it up?

MR. THOMAS: Couple of reasons. First of all, I think that when you look at the time durations of our coping strategy at the point where this equipment is going to be connected, we're going to be in a situation where the plant is in a relatively stable condition and could operate under those conditions indefinitely.

MEMBER STETKAR: If everything works.

MR. THOMAS: If everything works.

MR. MOOKHOEK: May I?

MEMBER STETKAR: Yes. Go ahead.

MR. MOOKHOEK: Bill Mookhoek. I'm the licensing supervisor. I had a large part in writing the FLEX plan.

Really, the reason we went with the 480 volt diesels is they would be easier to transport. They get the load centers, the 480 volt load centers on a Class 1E system, two of those energized. And it would allow us to energize not only the battery chargers, but also a ventilation system and other MCCs, et cetera, that we may want to.

Now, we may --

MEMBER STETKAR: And just for the record, you can also do that if I repower the 4 kV buses.

MR. MOOKHOEK: Correct.

MEMBER STETKAR: Okay.

MR. MOOKHOEK: Playing the 4160 is a little bit different than playing with 480 volt, but --

(Laughter.)

MEMBER STETKAR: Not if the bus is dead. The bus is dead.

MR. MOOKHOEK: I agree.

MEMBER STETKAR: It's hooking up cables into plug-in connectors.

MR. MOOKHOEK: I agree, but we were trying to -- I was trying to keep it simple.

MEMBER STETKAR: Yeah, but my point is that you're actually presuming that things work that can make it more complex for the operators than giving them greater -- I'll use that term "flexibility." Giving them greater flexibility by providing 4 kV power where you have a lot more equipment available to the operators. Other alternatives that they don't have at only the 480 volt plus level.

MEMBER BLEY: We had a discussion like this with some of the folks involved in originating the strategies.

And I guess on the one hand I can understand you got to start somewhere and having a fixed event is a place to start, but the concept was one of flexibility to deal with other things rather than that one specific thing.

And I think we're losing that in various places as this gets implemented, but go ahead.

MR. MOOKHOEK: And part of the other piece was do we really believe that the CTGs are going to be available?

The only reason we can't credit them is because of the guidance.

MEMBER STETKAR: Fukushima really believed that they weren't going to have anything high than three meters, okay. This is -- CTGs are qualified for 0.13 g.

MR. MOOKHOEK: Correct.

MEMBER STETKAR: Okay.

MR. MOOKHOEK: And the guidance --

MEMBER STETKAR: You really believe that, but maybe they won't.

MR. MOOKHOEK: The guidance we were working on allowed us to credit the CTGs as robust simply because they're transported over ground.

Are we going to think about doing 4160 as we finish the plant design and modify and update this plant? Yes, I'm sure we will.

MEMBER STETKAR: Except for the fact that you're getting NRC approval of your strategy with this snapshot in time.

MR. MOOKHOEK: Correct.

MEMBER STETKAR: And I'm going to ask the NRC the same question about did they ask about flexibility, or did they simply stovepipe into a pre-defined notion of what this scenario shall be.

MR. MOOKHOEK: Well, I think you'll see that we also have replacements for -- and backup equipment for the ACIWA system. So, we do have additional pumps in the plan that can replace that diesel-driven fire pump.

MEMBER STETKAR: Not formally, though. You don't take credit for them in the formal plan that's been --

MR. MOOKHOEK: Because the guidance tells me I don't have to assume that there's another failure, that there are two other diesel-driven pumps per unit which are in 1E.

MEMBER STETKAR: Right.

MR. HEAD: And you're hearing Bill, I think, you know, somewhat hidden, this is a -- there's more to the story here than just a decision of 480 versus 4160.

There are a lot of other capabilities that we have with respect to this issue and this event that went into this decision.

MEMBER STETKAR: My simple question is, though, forget about the event and the guidance and my assumption.

Why wouldn't I, why would I not bring in a 4 kV diesel generator to provide me more flexibility? Why would I not do that?

And it's not because it's higher voltage, because these guys are not connecting 4 kV power live. And it's heavier, but I'm telling you other people are flying in 4 kV diesel generators.

So, FedEx and big trucks are available to get the big diesels there. So, it's not bulk. It's not, you know.

MR. HEAD: But we were --

MEMBER STETKAR: So, why would I not do that?

MR. HEAD: We were making this decision in the context of everything else that's available to us.

CHAIRMAN CORRADINI: Okay. Go ahead, Steve.

MR. THOMAS: Okay. I think I'm ready for the next slide. What I'd like to do is talk about each of these components briefly.

The combustion turbine generator. Again, we're not taking credit for this. Again, it's a significant piece of equipment.

Each unit has a combustion turbine generator rated at 20 megawatts. These are completely independent from the standby diesel generator systems, electrically, fuel, physically separated.

Each diesel generator is capable of supplying all three of the Class 1E buses in that unit, or one Class 1E bus if there's only one of the two combustion turbine generators available, can be cross-connected to the other unit and you can power one of the Class 1E 4160 buses in each unit from a single combustion turbine generator.

They are, by their nature, seismically robust. We haven't gone through the rigorous process of demonstrating that yet, but there are similar size components that are available for emergency transport over the air and highway systems and, I mean, it's basically a jet engine.

So, the component itself is seismically robust and we have committed to protect this in a structure from design-basis hurricanes, tornado missiles. And as I mentioned earlier, it's already in the certified design protected from the design-basis flood.

The AC-independent water addition system, it's a diesel powered system. It's a common installed diesel fire pump with the two units.

In addition to this pump, there is one fire truck per unit which can be substituted for the ACIWA pump. And for each unit, there is a trailer-mounted diesel power pump available for backup for the ACIWA pump.

The ACIWA system connects to the RHR system. And in that capacity, it is capable of providing injection to the core, capable of providing drywell and wetwell spray, which we do not acquire in our FLEX strategy, and is also capable of providing spent fuel pool makeup.

MEMBER BLEY: When you say you're not required, you're still going to put in the connection points so you can hook it up, or not?

MR. THOMAS: Yes, it's there in the existing design.

MEMBER BLEY: It is, okay.

MR. THOMAS: It is. The pump has a sufficient capacity to provide the required flow rates for both units and provide makeup to both spent fuel pools.

The two fire water storage tanks again which we have qualified both of those for protection against the design-basis external events, have a combined capacity of greater than 600,000 gallons.

The fuel tank supply to there we have committed to provide at least 36 hours of operation for the system. And it's protected from the site-specific seismic, missiles, floods and external events.

CHAIRMAN CORRADINI: And this is used after you use RCIC to bring it down to a pressure that is --

MR. THOMAS: That's correct.

CHAIRMAN CORRADINI: Okay.

MEMBER STETKAR: Well, it cools you down and you still have to actively depressurize.

CHAIRMAN CORRADINI: Right. But still this is not in support of RCIC operation. This is after RCIC has cooled you down and --

MR. THOMAS: After the period of RCIC operation.

MEMBER STETKAR: That's what I was going to ask. What happens if RCIC doesn't work?

MR. THOMAS: I'm sorry?

MEMBER STETKAR: What happens if RCIC doesn't work?

MR. THOMAS: Then we depressurize and use the system.

MEMBER STETKAR: Does it have enough flow rate at time -- pick a number -- 20 minutes or so?

MR. THOMAS: Yes, it does.

MEMBER STETKAR: Okay.

MR. TOMKINS: And if it happened at T equals zero, it's close.

CHAIRMAN CORRADINI: So, the backup plan, that's what I was trying to understand. The backup plan here is that if RCIC fails to take you down or it fails in some portion of that, you would immediately depressurize and go to this.

MR. THOMAS: Yes.

MR. TOMKINS: Yes.

MR. HEAD: RCIC is a pretty simple system.

MR. THOMAS: But under that scenario, that's what we would do.

CHAIRMAN CORRADINI: I think if I heard correctly, you're going to get to the scenarios in a minute. So, I'll wait.

MR. THOMAS: Yes.

CHAIRMAN CORRADINI: I had a couple other questions, but I'll wait.

MR. THOMAS: Yes. Okay. The RCIC system is really the keystone of the system. As I mentioned earlier, did have the opportunity recently to go to Scotland and talk to the manufacturer of this component. And I was impressed with it before, and I'm probably more impressed now.

CHAIRMAN CORRADINI: Who is the manufacturer?

MR. THOMAS: Clyde Union.

CHAIRMAN CORRADINI: Okay. So, it's not Dresser.

MR. THOMAS: It's not a Dresser component, no.

CHAIRMAN CORRADINI: Okay.

MR. THOMAS: It is a very simple and rugged machine. It's a mono-block. It's a single shaft with the turbine on one end and the pump on the other end. It's self-lubricated, water-lubricated by the process flow.

It supplies water to the core over the full spectrum of reactor vessel pressures. Takes suction initially from the condensate storage tank or the suppression pool.

In our analysis, we credited 250,000 gallons of the over 500,000 gallons capacity of the condensate storage tank.

And since the RCIC is part of the emergency core cooling system, it is safety-related and is protected from all design-basis external events. In this case, 0.3 g.

(Comments off record.)

CHAIRMAN CORRADINI: So, can I ask a question in this regard? Maybe it's in the writeup and I don't remember it.

Why did you only pick half the inventory as credited? I didn't understand that.

MR. THOMAS: The level in the condensate storage tank will fluctuate some.

CHAIRMAN CORRADINI: Oh, okay. So, it's just where it might be at any given point in time, okay.

MR. THOMAS: There are some unavailable volumes at the top and at the bottom. And then there's an operating band in the middle. So, we were not able to take full credit for that.

Although it's in all likelihood that there will be more than 250,000 gallons there, we only credited the 250,000 gallons.

CHAIRMAN CORRADINI: Okay. Thank you.

MR. HEAD: For example, if there was a hurricane in the Gulf, that would be 500,000 gallons. It's part of the site procedures to fill up the tanks.

CHAIRMAN CORRADINI: Thank you.

MR. THOMAS: Okay. The containment overpressurization system is the hardened passive vent system for the ABWR.

The rupture disk for this system, it's a completely passive system. Operates at about 90 psig. And this ensures containment integrity.

And then of course when you start venting the containment, that provides containment cooling capability.

These components are located inside the Reactor Building. And as such, they would be designed to the 0.3 g criteria for the components in the Reactor Building.

MEMBER STETKAR: I don't read ahead fast enough. So, tell me when you get into the scenarios. I track power supplies for the COPS isolation valves and I know they fell open on loss of power. They fell open on -- they're only shown as they have an air supply to them; is that correct?

They're from air, not --

MR. THOMAS: I think it's nitrogen, but yes.

MEMBER STETKAR: Well, I couldn't track it down. So, when you say you think, that's going to be part of my question is I couldn't find a connection from the nitrogen bottles that you connect to the SRVs, which I'll get to later --

MR. THOMAS: Okay.

MEMBER STETKAR: -- into the COPS isolation valves. My question is, in a practical sense if you do not -- I understand how you'll have power to the solenoids. But if you don't have pneumatic pressure, you may not be able to reclose those valves.

I don't know whether you want -- there are statements in there saying, well, once we've stabilized the plant, we'll go reclose the COPS line and control ourselves otherwise.

Can the operators actually do that if they don't have instrument air?

MR. MOOKHOEK: Part of the equipment we're bringing in for Phase III is a portable instrument air compressor.

So, we will tie in an instrument air compressor not only for these vales, but for any of the other AOVs that we need to operate.

MEMBER STETKAR: Thank you. That helps. Thank you.

MEMBER POWERS: You ought to check to see if that's air or nitrogen.

MEMBER STETKAR: Yeah, I couldn't find -- I tried -- the problem is the instrument air drawing is just so stubs going out. And I couldn't find a connection on -- the nitrogen drawings are more complete. I couldn't find a connection.

MR. THOMAS: Yeah, I looked at that once and I'm not going to make a positive statement like the last time.

MEMBER STETKAR: It could come off a tie-in on the nitrogen side that just shows as an arrow, but there are some check valves that prevent the nitrogen bottles feeding backwards into that part of the line.

MR. THOMAS: I don't think it would come off of the nitrogen bottles. That's specifically for ADS, but it may come off the non-safety-related nitrogen system.

MEMBER STETKAR: Yeah.

MR. THOMAS: That's what I'd have to check.

MEMBER STETKAR: Yes, okay. Anyway, the air compressors are good enough for me. Thanks.

MR. THOMAS: Okay. I mentioned earlier we do have four divisions of Class 1E batteries capable of more than 12,000 amp-hours.

We're also using non-Class 1E batteries for some of the communications requirements and have an 8,000 amp-hour capacity.

We do require load shedding, which Bill is going to discuss in considerable detail, which can extend the Division 1 battery alone to get us entirely through Phase I of the event for 40 hours.

Now, that's a significant point circled out on mine that combined capacity for Division I, II and III Class 1E batteries gives us about 72 hours capacity.

Our Phase I coping capability for 36 hours, we can handle with only one division of these batteries. So, we have a substantial margin on battery capacity, which is a significant advantage.

CHAIRMAN CORRADINI: So, you're counting on this shedding to take you to whenever offsite stuff happens, because you jump from Phase I to Phase III.

MR. THOMAS: Correct.

CHAIRMAN CORRADINI: Okay. So, let's say something goes wrong. IS the RCIC system designed and operators trained such that they can run RCIC manually?

MR. THOMAS: Absolutely. RCIC system can be operated entirely without external services. All it needs is steam and a suction supply of water.

MEMBER STETKAR: Part of that I was going to wait until Bill came up, but you're stealing --

CHAIRMAN CORRADINI: I'm allowed to ask a question.

MEMBER STETKAR: No, that's -- part of the -- as I go through the scenarios, it says that an operator will be dispatched to the RCIC room.

Is that required?

MR. THOMAS: If somebody --

MEMBER STETKAR: I'm eventually going to get to a point where I'm counting bodies. So, I'm starting to take an inventory of bodies.

MR. MOOKHOEK: In this case, I would say it's normal practice, but as a operations supervisor the answer to that would be yes.

MEMBER STETKAR: Okay.

MR. MOOKHOEK: That's a vital piece of equipment. I want someone there.

MEMBER STETKAR: So, I'll put a body over in the RCIC room.

MR. MOOKHOEK: Put a body there.

MEMBER STETKAR: Okay.

MR. MOOKHOEK: He may not be there the whole time, he may be running back and forth between the shutdown panel and RCIC room, but --

MEMBER STETKAR: The shutdown panel has absolutely no control or indication for RCIC though; is that right?

MR. MOOKHOEK: That is correct.

MEMBER STETKAR: Okay.

MR. HEAD: Except water level.

CHAIRMAN CORRADINI: Except what?

MR. HEAD: Water level.

MR. MOOKHOEK: It has water level in the CST and the suppression pool.

MEMBER STETKAR: Yes, but I man --

MR. MOOKHOEK: But as far as RCIC itself goes, there's no flow rate, there's no indication of valve positions. That's all local.

MEMBER STETKAR: Okay. Thanks.

MR. THOMAS: Next slide. I mentioned earlier that the AC-independent water addition system was capable of providing makeup to the spent fuel pool via the RHR piping. That is the preferred method.

MEMBER BROWN: Can I ask a -- go back to the power supply for a minute. In most of the documents that were submitted, there is a letter from the IEEE Standards Group, which you all referenced, as well as NRC referenced in their audits.

And that talked about the curves and -- the graphs that they, you know, charts they provided. And they were based on like a 1.215 nominal voltage. And then they talked about going down to 1.75 volts per cell in the extended period that could be utilized out to that.

And that's, what, 1.215 to 1.75, there's

-- what am I missing? I lost the bubble a little bit between those two numbers.

MR. THOMAS: I'm going to ask Evans Heacock to address your question.

MR. HEACOCK: This is Evans Heacock. Your question about cells --

MEMBER BROWN: Yes.

MR. HEACOCK: Cell voltage.

MEMBER BROWN: Yes.

MR. HEACOCK: Typically your open cell voltage will be about 1.25, like you said. And then --

MEMBER BROWN: Right. 1.2 --

MR. HEACOCK: Yeah, 1.2.

MEMBER BROWN: 1.215, or 1.25? The PES documents are based on -- their tables are based on a 1.215 specific gravity.

MR. HEACOCK: Yes. Specific gravity, yes.

MEMBER BROWN: Okay.

MR. HEACOCK: But the volts to the cell --

MEMBER BROWN: The voltage would be --

MR. HEACOCK: Yes, it gives you a different open --

MEMBER BROWN: -- 2.5?

MR. HEACOCK: Not that high. It won't be

2.5.

MEMBER BROWN: Okay. I didn't think so.

MR. HEACOCK: It's a little lower than than two volts per cell when you first have the event when you take it off charge and go to the open cell.

MEMBER BROWN: Yes.

MR. HEACOCK: But it will drain down. It will drain the batteries down to a voltage of about 105. Just a little above 105 volts. About 106 to --

MEMBER BROWN: From 200 --

MR. HEACOCK: From nominal of 125 for the safety-related battery --

MEMBER BROWN: Okay. About a 17 or 18 percent reduction then, roughly. I guess my question goes do you have to feed invertors to develop the power for these.

MR. HEACOCK: Right.

MEMBER BROWN: And I presume your invertors cover that --

MR. HEACOCK: Correct.

MEMBER BROWN: -- full range and --

MR. HEACOCK: The invertors built these days typically go down to about a hundred volts before they'll shut down.

MEMBER BROWN: Okay.

MR. HEACOCK: That's what's going to --

MEMBER BROWN: When you say typically, I mean --

(Speaking over each other.)

MR. HEACOCK: That's part of the overall analysis that will be covered when you look at what your overall voltage profile is going to be for a distribution system.

And they'll have to be -- ensure that these will be covered down to 105 to 106 at the battery, because your voltage drops from your distribution panel all the way out to your invertor included.

MEMBER BROWN: Okay. So, that's the kind of number you used in doing the --

MR. HEACOCK: Yes.

MEMBER BROWN: -- discharge and the load analysis as you shift cells.

MR. HEACOCK: Correct.

MEMBER BROWN: Okay. Thank you.

CHAIRMAN CORRADINI: Okay. Go ahead, Jim.

MEMBER BROWN: Let me ask one other question.

CHAIRMAN CORRADINI: Okay.

MEMBER BROWN: Sorry. You say it's typical that they typically for the 125 volt input capacity rating to the invertors, that they will work down to 105, roughly.

Did somebody verify that by test or something like that for what you all are getting? Are your all's custom, or are these standard off-the-shelf invertors, or what?

MR. HEACOCK: Well, at the -- okay. For -- and I'll give you some of what I've dealt with in the industry.

We have procured a number of invertors for different sites. STP included, 1 and 2. When we procured new invertors there, they were operable down to a hundred to 102 volts as an input to the invertor itself.

MEMBER BROWN: Okay. And you all confirmed that.

MR. HEACOCK: Yes.

MEMBER BROWN: The actual testing or operation --

MR. HEACOCK: Yes, actual, live test.

MEMBER BROWN: Live test, okay. All right. That's -- so, you've got experience.

MR. HEACOCK: Yes.

MEMBER BROWN: You've confirmed that.

MR. HEACOCK: Yes.

MEMBER BROWN: Okay. That's all I was looking for.

MR. HEACOCK: Okay.

MEMBER BROWN: Thank you.

MR. HEACOCK: Okay.

MR. THOMAS: Okay. I did mention that ACIWA is the preferred makeup method to the spent fuel pool via the RHR system.

We do have two external standpipes that can provide makeup and spray to the spent fuel pool. These were added as part of the loss of large area effort, but they are there. They are on opposite building -- opposite sides of the Reactor Building. And those would be available for temporary hookups if for some reason we could not provide makeup with the RHR slant final portion of the system.

Just to summarize, the ABWR was really designed for a station blackout with or without the CTG before the Fukushima event and before FLEX strategies came along.

We fully expect the CTGs are going to be available to provide power to mitigate this event using the normal ECCS systems. However, we do not take credit for them in our FLEX strategy.

We have made additional enhancements to

the components that we've discussed today in order to satisfy the additional requirements imposed by NEI 12-06 required to take credit for installed equipment.

And even without crediting the combustion turbine generators, ACIWA, RCIC and COPS can mitigate the extended loss of AC power events.

CHAIRMAN CORRADINI: So, can I say it differently just so that I think I get it, but in difference to my colleague?

So, the DCD design safety-related equipment can take something that is not site-specific, but just turns out to be much more robust.

But given the current rules of the strategy, you can't take credit for that because it's installed equipment and, therefore, it can't be credited.

MEMBER STETKAR: Electrical, but they can take credit for other stuff like --

CHAIRMAN CORRADINI: Right.

MEMBER STETKAR: -- RCIC.

CHAIRMAN CORRADINI: Right. I understand. Thank you very much, but have I got it about right?

MR. THOMAS: You were speaking about the combustion turbine generator.

CHAIRMAN CORRADINI: When I read 1E, I got a little confused. And then I tried to go backwards and I just got more confused, but I think I get it now.

Have I said it approximately right?

MR. THOMAS: Yes, sir.

CHAIRMAN CORRADINI: Okay.

MEMBER BLEY: I have another question on this. These are the rules you are following to design the strategy.

Are you following those same rules when you write the procedures for carrying out the strategies, or do you let the people use everything that works?

MR. MOOKHOEK: I'll go into it here in a minute.

MEMBER BLEY: Okay.

MR. MOOKHOEK: We wrote this plan as what will I have to have at minimum to show protection for indefinite protection for the core and fuel. And that's what we came up with.

So, there is a lot more capability that isn't addressed in the plan, but the plan basically gives us our minimums.

MEMBER REMPE: So, maybe this is the time to bring up this question. If I look at the plan, there's instrumentation you've identified. And I'm curious is that the minimum instrumentation that you need and did you use your existing ~~spurious~~ severe accident management guidance, or did you come up with a new guidance to identify that minimum set? And then were some changes made to make that instrumentation work with us?

MR. THOMAS: All right. You want me to answer that?

PARTICIPANT: Sure.

MR. THOMAS: I'll try. The instrumentation we're taking credit for is basically the installed instrumentation that's provided in the original design at the remote shutdown system panels.

So, we did not enhance that instrumentation. It's there. It provides more than the minimum of what we need, but it does provide the minimum of what we need in order to assess the plant conditions and control the systems necessary to take us through our FLEX strategy.

MR. MOOKHOEK: And the other important part about it, that's essentially the safe shutdown instrumentation for fire in the control room. It's an analog system instead of a computer-driven system.

And because of our plan where we're going to turn off the computer system because of the load on the batteries and the heat generation in the area, we rely on that installed analog system.

MEMBER REMPE: Thank you.

MR. THOMAS: Does that answer your question?

MEMBER REMPE: Yes.

MR. THOMAS: That concludes my portion of the presentation. Right now I'm going to turn it over to Bill Mookhoek to walk through our FLEX strategy.

Bill, as he mentioned, was eminently involved in developing the implementation of the strategy primarily using installed equipment.

And so, Bill, I'll let you go ahead.

MR. MOOKHOEK: Since this is really the first time, I'll talk to you a little bit on my background.

I joined STP in 1983 as part of the initial manning for operations after 12 years in the Navy with nuclear submarines.

I served in operations until '95. And I spent four, five years as shift supervisor on shift in Unit 1. So, I was there for the initial startup, testing program and operation and several of the major events that we had there in that period of time.

At that point, I shifted over, did some

time in licensed operator training and then went to licensing.

I had the opportunity to come over and be the licensing supervisor for the application for 3 and 4 and worked on a new reactor, which was very interesting.

But I am a PWR guy and moved over to a BWR and they almost convinced me to boiling reactors. Not a bad thing.

(Laughter.)

CHAIRMAN CORRADINI: You would never convince me.

(Laughter.)

MR. MOOKHOEK: That's one of the things the Navy always taught you. Never ~~boiler~~ boil a reactor.

MEMBER BROWN: As long as you have a hardware watchdog timer, it will come up.

MR. MOOKHOEK: All right.

CHAIRMAN CORRADINI: Let's move on.

MR. MOOKHOEK: When we started looking at what did we have to do to answer the staff questions on the orders that were going out to the operating fleet, this was at a time when there was -- NEI 12-06 was really just being developed in draft. It had just been submitted to the NRC for approval and we started putting our plan together.

So, we used 12-06 as the guidance. The big point in that, as I said before, is you assume that you lost all of your onsite AC power generation equipment and that the ultimate heat sink was unavailable as well essentially because it had no power.

So, our goal was to because of the capabilities of the ABWR, was to use installed equipment as much as possible.

Phase I on the NEI guidance is strictly installed equipment. You survive on your own. Phase II was you have portable equipment on site that you could connect and bridge the gap between the onsite installed equipment and the offsite equipment showing up.

As we went through and did the analysis and looked at what our capabilities were, it became apparent that we didn't need a Phase II, because our Phase I usage with the installed equipment could bridge that gap itself and get us to the 36 hours. We expect to have the first equipment on site in 32 hours. So, we really don't have a Phase II, per se.

We do use some portable equipment we have on site mainly for transferring fuel from either the diesel generator fuel oil storage tanks, or the major fuel oil storage tank for the CTG into the ACIWA fuel oil storage tank. Other than that, we really don't need much else.

We specify having an air compressor brought in with the FLEX diesels, but we also have onsite as part of our portable equipment additional pumps, diesel-driven pumps that can replace the ACIWA pump, power supplies, small generators and ventilation fans that we will use.

The plan doesn't specify where specifically that defense-in-depth equipment goes, but we felt it was necessary to have the flexibility for operations to go do what they need to do based on anything that may happen.

So, our Phase I is 36 hours. Phase III directly follows that with no Phase II. And, again, the offsite equipment we're assuming shows up at the staging hours within 24 hours of request.

We ask for that conservatively within two hours of the event initiation. That means it should be there ready for use in 32 hours.

MEMBER STETKAR: Bill, what triggers -- you said we ask for that conservatively, and I never know what "conservatively" means, within two hours of the event.

What actually triggers people to call up the center and say, help me, I need the equipment?

MR. MOOKHOEK: It will be definitely driven by procedures. The emergency operating procedures will have a kick-out at 30 minutes to tell you to go initiate the procedures for an extended loss of AC power, which gets you into the FLEX plan.

That procedure, part of that and the fact that you also have an ERO organization, you're in the emergency plan. So, it will be built into the plant procedures at this time both in the control room and with the ERO staff.

CHAIRMAN CORRADINI: But what physical - - I think what he's asking is what physical plant status would --

MEMBER STETKAR: I would hope it would be in procedures.

CHAIRMAN CORRADINI: That would be -- you would look at and say, you know, this has happened, this has happened, this has happened. I better go do X.

MR. MOOKHOEK: Right.

CHAIRMAN CORRADINI: What is the physical state -- what physical states would have to be there to ask for outside assistance?

MR. MOOKHOEK: All the diesels failed, both

CTGs failed for a period of 30 minutes with no expectation to restore power. At that point, you kick out to the new procedure.

MR. HEAD: That's covered in some slides here.

CHAIRMAN CORRADINI: Oh, yes. If you're coming, then you can hold us off. That's fine. Okay.

MR. MOOKHOEK: As we looked through the external events, it became -- for South Texas because of the fact that we deal with hurricanes normally, we would have shut the plant down for a hurricane before hurricane-force winds get on site.

We also preemptively start and load a diesel generator before we get hurricane-force winds on site.

It's an event we see coming and we are well prepared for it. We have additional people on site.

We don't get a big enough flood with hurricanes or storm surges to impact the plant significantly.

Seismic, we have done all the current guidance seismic analysis for the plant. So, we didn't have to go redo any analysis for seismic or for hurricane missiles, tornado missiles. That was all done with the current guidance.

Our limiting event that we chose for this was a breach of the main cooling reservoir embankment, because it is the event that puts the most water on the site for the longest period of time.

CHAIRMAN CORRADINI: This has also been your -- well, this is your main event from the severe accident standpoint.

MR. MOOKHOEK: Design-basis flood. It is our design-basis flood.

MEMBER STETKAR: Why didn't you select -- you said this is your limiting beyond design-basis external event.

Why didn't you pick a 0.5 g earthquake as your limiting beyond design-basis external event? For reference, it has about a factor of 10. It's about a factor of 10 less likely than your 0.13 g earthquake in frequency according to your site-specific seismic hazard -- mean seismic hazard at an absolute frequency, for Dr. Powers' benefit, of about 1E to the minus six per year.

So, when you're talking about limiting beyond design-basis events, I start to get curious about how you determine what's limiting, not probably the biggest flood you can get.

MR. MOOKHOEK: I mean, I guess the answer to that question is what would be the criteria for selecting a -- any earthquake bigger than what your maximum design-basis earthquake is.

MEMBER STETKAR: Well, I'm sorry. The maximum design-basis earthquake from the certified design could be conceived to be 0.3 g.

MEMBER RICCARDELLA: Wait. Wait. Wait. Not in Texas. No. The 0.13 g as I understand it, is the currently reevaluated seismic hazard at the site by the CEUS and by Recommendation 2.1.

MEMBER STETKAR: That's absolutely correct.

MEMBER RICCARDELLA: The 0.3 g just happens to be what the standard design can tolerate.

MEMBER STETKAR: That is also absolutely correct.

MR. MOOKHOEK: We had to start somewhere. I don't know how to --

MEMBER STETKAR: The point is you do need to start somewhere, but statements like "this is my limiting beyond design-basis event," implies that you've thought about everything and nothing can be worse than this. And that's not true.

MEMBER POWERS: I mean, that would never be what they would imply.

MEMBER STETKAR: It wouldn't be, because you need to --

MEMBER POWERS: Well, I mean, they can sit down and say my limiting event is the asteroid Ceres slamming into my planet there. That would be a limiting event, by your logic.

MEMBER STETKAR: No, my logic is that when one makes absolute statements like this, one is presuming --

MEMBER POWERS: You are --

MEMBER STETKAR: Wait, Dana. Let me finish. One is presuming to have done some sort of frequency screening.

And my question is, has that frequency screening been done? Because this has been selected deterministically as the limiting event.

I don't know what the frequency of this event is compared to the frequency of a 0.5 g earthquake.

I know what the frequency of the 0.5 g earthquake is. And indeed if the frequency of this flood giving me much worse conditions is much higher than the frequency of that 0.5 g earthquake, I'm willing to accept the notion that for all practical purposes they can accept this.

MEMBER POWERS: So, for the practical purposes, the difficulty is we don't have the equivalent of geologists going out and looking at paleo floods. We just can't do it because all the evidence gets wiped out after about a thousand years.

And so, 10 to the minus third is like --

(Speaking over each other.)

MEMBER POWERS: I mean, this seems like a reasonable, probable limiting event whereas you're hypothesizing an earthquake that seems beyond the pale for anything that anybody else has to look at.

MR. HEAD: John, I understand your point. This is added here because the flood impacts the time that operators can do different things on the station.

Okay. It has an impact that we needed -- we felt like we needed to address and is embedded in our FLEX plan.

If there's a bigger seismic event, I don't know what we would do other than expect a lot of this stuff, even the bigger seismic event to work, but that's the reason it's in here. It's with respect to the FLEX plan that we added this word in there.

It's basically saying the main coolant reservoir in this flood is the -- has the limiting impact in terms of what operators can do.

MEMBER STETKAR: See, I have no problem saying we designed our strategies for this event, period.

MR. HEAD: Okay.

MR. MOOKHOEK: Okay.

MEMBER STETKAR: I have no problem with that notion in the same sense that we have design-basis events that we design -- you have to design for something. But to characterize things as saying this is the limiting beyond design-basis event --

MR. HEAD: We designed it for this FLEX plan. We used the MCR --

MEMBER STETKAR: And no problem with that.

MR. HEAD: And it's --

MR. MOOKHOEK: From our viewpoint, it's the most challenging.

CHAIRMAN CORRADINI: But can I just -- I'm watching you guys have at each other and it's entertainment.

However, I want to make sure I get back to something that Dana said, which I make sure that John -- because I think you guys are both on the same page, but I want to make sure I understand it because this I don't get, is that really your biggest issue is they can't -- since I can't estimate the frequency of the flooding event, then you can't claim that it's limiting, because I don't know the frequency.

And, Dennis, point back to you is that given just the way hydrologists do that, it's not possible at this point technically. That's what I heard him say to you.

MEMBER STETKAR: That's true. On the other hand as Dennis mentioned, this is not a notion of probable maximum precipitation. This is a manmade design facility that there is evidence for estimating frequencies of failure.

And they've done that in their PRA. So, if they could do that in their PRA, why can't, you know, they have that information.

MR. HEAD: Well, just back on the presentations on that, even this flood is very conservative.

We had to generate an incredible growth gap to --

CHAIRMAN CORRADINI: Yes, I was just going to say I thought we went through that.

MR. HEAD: Right.

CHAIRMAN CORRADINI: And we all agreed that they were on the slightly conservative side on if it failed and how much it grew, how fast it grew and how it essentially ran up to the plant site, if I'm remembering correctly.

MR. HEAD: We grew it as fast as we could to the maximum extent that was reasonable to assume.

MEMBER BLEY: The big old doors are closed; is that right?

MR. HEAD: Doors are closed and, like I said, as part of our, you know, part of the thinking is that, you know, even this flood does give you time to recognize that it's coming.

Okay. You will be shutting the plant down as this is happening. Okay. Because you're going to lose your cooling. So, you'll be shutting the plant down.

And so, we weren't trying to say something exotic or global with the limiting external event. It was just something we included in our thinking, because there is water on the site and we won't be able to do a number of things while the water is on the site.

So, we need to be --

MEMBER BLEY: And I think, you know, if it were phrased that way in terms of it affects the people more than others --

MR. THOMAS: Yes. I think that after having listened to this discussion, I think I would prefer to use Bill's terminology.

We felt this was the most challenging event in terms of our ability to move around the site to get equipment around the site. For example, it would be very difficult to access portable storage equipment while you've got six feet of water at the site and move it someplace where you need it.

That was the thinking in putting this bullet on the slide, not to indicate that it was somehow an overarching ultimate criteria.

So, I understand your point. I'm happy to change the word "limiting" on this if it makes it a more appropriate comment.

MR. MOOKHOEK: Okay. Poor choice of words on my part, but that's --

CHAIRMAN CORRADINI: That's okay. I learned something. Nicely done. Let's go.

MR. MOOKHOEK: In our plan, we assume that the extended loss of AC power, or the ELAP, occurs at time zero. But as Scott said, there is some lead-in time. The events don't happen instantaneously.

And this actually requires the failure of all six ESF diesel generators, both CTGs and six offsite power sources. So, it's a pretty significant process.

MEMBER BLEY: It is, but here's where that earlier discussion about flexibility and the like comes in.

If you really think about this scenario --

MR. THOMAS: Which we have.

MEMBER BLEY: This scenario is very unlikely to occur by those eight things just failing. It's almost certain -- the probability that there's more stuff going on than just these things breaking is much higher than the probability that nothing else is going on and these things are breaking.

So, when we focus what we're doing strongly assuming that nothing else is there is troublesome -- now, I think eventually when you get to doing your SAMGs and dealing with this equipment and maybe trying to integrate it in, you have to deal with those kinds of issues, but it's a bit of an artificial piece.

And when we limit the flexibility of FLEX to meet this, that artificial scenario, it's just kind of a --

MR. HEAD: I think maybe limiting the flexibility of FLEX is in that context. We think our capabilities are much more than FLEX. And Steve has gone over that.

And as Bill has alluded to, we would not limit ourselves to FLEX, okay. It's what we needed as part of a licensing strategy, but there are more pumps, there's more capabilities and there's more to the context, I think, with respect to what would cause that to happen.

Okay. We believe the most significant or most likely way it would ever happen would be induced by a hurricane. All four units would suffer through a hurricane. But to look at that as just --

MEMBER BLEY: I wouldn't argue with you on that one, yes.

MR. HEAD: I'm sorry?

MEMBER BLEY: I said I would not argue with that.

MR. HEAD: Okay. And so, the planning as I alluded to, the filling of tanks, the preparation for it, the reactor is shut down, that would be a different event than just this all failing immediately and but we think we can accommodate easily both.

So, I hope -- I don't know if that's answering your question or maybe just adding to the discussion, but -- so, anyway, go ahead.

MEMBER BLEY: It adds to the discussion. Since I interrupted, you're going to get to that bullet about load shedding.

MR. HEAD: Yes.

MEMBER BLEY: Earlier you mentioned that one of the things you do is kill power to the computer to save those batteries.

How do you get real confidence that turning off the power to your computer doesn't lead to some weird stuff happening around the plant that you weren't expecting?

I mean, any control systems I've played with and tried to keep power and things like that, it's not -- you're introducing an event on that system that, you know, if you just look on paper, maybe you say I'm pretty convinced, but weird stuff often happens when you pull power. And especially to a system that's controlling stuff.

And I'm just -- how do you have confidence that we're not introducing something that's going to be more troublesome than where we started?

MR. THOMAS: The presumption is there's no other power in the plant for weird stuff to happen. I mean, you could have all kinds of perhaps signals being generated, but there's no power-operated equipment in the plant.

The plant is dead. And the only thing that's powering those computers are the invertors from the batteries.

MR. MOOKHOEK: And we do look at what's going to happen especially with the RCIC system. We turn the computers off. The automatic control in RCIC goes away. It no longer auto starts and stops. It's going to be totally manual.

And if the pump is running when we turn off the computers, it's going to continue. If it's not running, it won't start. We'll have to either turn it -- throttle it down if it's still running, or we'll have to restart it. And the plan recognizes that.

The rest of the computer system, as Steve was talking, there's no AC power out there for it to actually start and stop things.

MEMBER BLEY: The reason I got real quiet, I'm thinking about what you said. And we came into this on no AC power, but I'm wondering if you have -- if you have no emergency power, but you have other AC power, might we initiate this? And then you might have some power that would do the -- I don't know the answer. I hope you've looked at that sort of thing and --

MEMBER STETKAR: Let me try something else that might help.

MEMBER BLEY: Yes, go ahead.

MEMBER STETKAR: In two slides we're going to get to everything is fine and dandy and we send people back into the control room and we power the thing back up. What happens then? What does it do to you and how do we know when we bring it back up again?

Because it now responds to stuff that we're not sure what signals it's going to respond to unless we're really, really careful about things.

MR. HEAD: Correct.

MEMBER STETKAR: Because it can perhaps put you on a -- it suddenly realizes that, oh, darn, I had a high temperature alarm from the RCIC exhaust and I'm going to shut down RCIC, and it does.

MR. HEAD: Well, I think the TSC, the Technical Support Center, with any other assistance including the procedures that we already have in place, because, I mean, we could lose power to this at any time much less ELAP.

I mean, so we -- we're going to have to have that embedded in our design and embedded in our procedures, but I think that would be a very careful moment for the plant to say, okay, we're going to start reenergizing this. What would happen?

And I think we would have a significant, you know, support from an onsite Technical Support Center or otherwise before we embarked upon that to say everything is stable and everything is fine before we

--

MEMBER BLEY: You need to think hard about it. I think back to the Robinson fire. And you got to the end of that -- and I actually got to go visit and talk to people who were involved in it.

And when they got to that and as you read about it and they reset their 86 relay, they didn't just do it. They talked to everybody there including people who were in training.

And it turns out in their training plan and what everybody knew in the plant, was the only thing that would do is reset the permissives and that nothing would happen.

And sure enough when they closed it, the breakers tried to reclose and that's when they got the second fire.

They've gone back and changed their training program and corrected drawings so it's all there. That's the kind of thing I'm trying -- when you get in a place like this and you, you know, if nothing happened when you lost power, but when you bring power back, really weird stuff can happen.

You got to be -- it strikes me that what you really need is for people to understand that and be ready for it, because you're not going to get it nail it perfectly. Something is going to surprise you when you do that. And it's not the kind of thing you're going to go do to test and see what happens.

MR. THOMAS: That is an extremely unusual circumstance. I agree with --

MEMBER POWERS: And it raises this whole issue of I take an event that gets progressively more and more extreme, but their intermediate states are actually more operationally complex, you know.

When you have a dead plant, that's an interesting thing electrically. It's a partially active plant that could be a lot more troublesome from an operational point of view.

And then, so we did a kind of a perturbed view of the world that when we keep pushing the more and more limiting catastrophes all the time -- I worry about that and I presume you have to take care of that via your procedures and --

MR. HEAD: I would say in Hour 40 if we're on ACIWA and we now believe that we have offsite or we've gotten a diesel to work that we would have a restart team that would have gone through all that process and ensure, for example, that that would not impact ACIWA, okay, because we don't want to lose it as we reenergize, and it would be a progressive process that you would verify that things are happening that --

MEMBER POWERS: Well, we have experience with this in other plants where they do a self-induced station blackout and fire. And they have to do it very carefully. No question about it.

MEMBER BLEY: If we're quiet, you should probably keep going.

(Laughter.)

MEMBER POWERS: Don't wait for us to dream up something else.

MR. MOOKHOEK: When the event occurs, we're going to enter the emergency operator procedures on loss of AC power. We will have all three emergency buses, switchgears deenergized.

That's going to kick us into a site area emergency and the ERO system will man -- will get -- the procedures will be written such that at 30 minutes if we haven't restored any power and we have no prognosis on being able to restore power, we're going to kick out into this FLEX plan the ELAP procedures.

What that procedure will tell us to do is to commence a load shed -- deep load shed on the Class 1E batteries and to shift command and control from the control room to the remote shutdown system in the Reactor Building.

I envision that we will send one reactor operator, one senior reactor operator to the remote shutdown system.

We will have two non-licensed plant operators doing the load sheds. And we will have a third plant operator going to the RCIC room to coordinate and manually operate RCIC.

With the load shed completed, that's going to give us greater than 40 hours of battery time on the Division 1 battery.

MEMBER BLEY: I can't remember. Do Units 3 and 4 share any operators?

MR. MOOKHOEK: They will probably share a yard operator.

MEMBER BLEY: But that's about it?

MR. MOOKHOEK: That's it. Other than that there's going to be two senior reactor operators, three reactor operators and five or six plant operators.

Now, with the loss of AC power, the Turbine Building is going to be in significant, shall I say, straits. And the flood levels will actually prevent folks from getting in there. So, I envision the entire staff will be in the Reactor Building/Control Building complex.

MEMBER BLEY: Okay. So, they're going to

have to abandon the Turbine Building. I didn't realize that.

MR. MOOKHOEK: Yes, it's --

MEMBER BLEY: I don't remember the layouts completely. So, I'm --

MR. MOOKHOEK: The flood level is 38.8 feet.

MEMBER BLEY: Okay.

MR. MOOKHOEK: And grade is 34 feet in the Turbine Building. So, this could be a fair amount of water.

MR. HEAD: For a relatively short period of time.

MEMBER BLEY: How long is that?

MR. HEAD: Well, it's 20 hours, but that peak immediately -- almost immediately starts coming down.

MEMBER BLEY: All right.

MR. MOOKHOEK: And the Turbine Building is actually further away.

The computer system and the reason we do the load shed is because of the computer system. It is the biggest load drain on the batteries. The invertors run the computer system. And not only that, but we've lost all the ventilation.

The digital instrumentation and control

system incorporates a lot of displays which generate a lot of heat. So, we want them off.

RCIC will provide the initial core cooling. Initially it's lined up to take a suction on the condensate storage tank.

After you get to the high level alarm in the suppression pool, it will automatically shift to the suppression pool with suction.

We envision -- the MAAP runs show us it will happen in a couple of minutes.

MEMBER BLEY: Did you have to add analog instrumentation, or is that already --

MR. MOOKHOEK: No, that's part of the ABWR design. It had a train of analog because the initial digital systems, they wanted a backup for them.

MR. THOMAS: Basically for the fire in the control room remote shutdown capability.

MR. MOOKHOEK: That was one of the reasons it was turn off the computers, go to RSS. It's analog. It's predictable.

Again, as I said, we'll operate RCIC manually after a load shed. And I said within two hours we'll ask for offsite assistance. That will be line items in the procedure.

CHAIRMAN CORRADINI: So, you operate RCIC manually after the -- so, the thinking process is you get away from any need for DC power control for RCIC.

You would go to the local operator to operate the system. That's what I didn't understand. I want to make sure.

MR. MOOKHOEK: Well, DC control for the RCIC is -- it's actually the computer that will actuate DC devices. That goes away.

CHAIRMAN CORRADINI: Okay.

MR. MOOKHOEK: And the controls, we will have local hand switches for the valves for RCIC.

CHAIRMAN CORRADINI: So, how does it trip off? What if somebody didn't operate it properly? It trips off on overspeed, I assume?

MR. MOOKHOEK: That's it.

CHAIRMAN CORRADINI: And so, the operator would sit there and then reestablish it.

MR. MOOKHOEK: In fact --

MEMBER STETKAR: No, I think he --

CHAIRMAN CORRADINI: I'm trying to figure out -- well, I have a couple questions, but you go ahead. I didn't mean to interrupt.

MR. MOOKHOEK: Yes, all those other trips on RCIC are all driven out of the computer system. So, when we turn the computer system off, those additional trips on the RCIC pump go away.

It initially, I mean, it will trip, it will turn off at Level 8. That's what it's designed -- it cycles between Level 2 and Level 8. That control will be gone once we turn the computers off.

Now, as you stated, overspeed will still be valid. It's a mechanical overspeed.

MEMBER BLEY: Is it still that kind of clunky system?

MR. MOOKHOEK: Well, this --

MEMBER BLEY: I think they've changed it in the last 20 years.

MR. MOOKHOEK: Well, this is not Dresser.

MEMBER BLEY: Okay.

MR. MOOKHOEK: Again, this is Clyde Union.

MEMBER BLEY: The one you were talking about, okay.

MR. MOOKHOEK: It doesn't have any electrical to it. It doesn't have any oil. And, in fact, the manufacturer starts and stops it with the overspeed trip. They leave the valves open.

(Comments off record.)

MR. MOOKHOEK: But, yes, they trip it locally manually and then just reset the switch.

MEMBER BLEY: Very simple machine.

(Comments off record.)

MR. MOOKHOEK: So, within two hours we're asking for offsite assistance. The SAFER teams will be notified. That should start getting equipment loaded and ready to us, sent to us.

We stay on RCIC on the suppression pool until the suppression pool temperature gets to about 250 degrees.

The manufacturer says that pump will run fine at 250. In fact, maybe even more. But at 250, we'll shift suction back to the CST at about 10 hours.

That eliminates the temperature issue from the pump and puts us on RCIC with the CST volume until we run out of that volume.

We expect COPS, the rupture disk, to actuate at about 20 hours, which will start venting containment.

Expect the offsite equipment --

CHAIRMAN CORRADINI: I guess I didn't understand -- can I go back to that one? That's the one I didn't understand -- oh, you switch off the CST at 10 hours.

This is because we're at the -- may I just ask, this is you at the 250,000 gallons so that you've run out and now you're doing recycle?

MR. MOOKHOEK: We're 250 degrees in the suppression pool.

MEMBER STETKAR: It's temperature rating on the bearings for the RCIC turbine.

MR. MOOKHOEK: For the pump.

MR. TOMKINS: At 10 hours, we haven't used the CST nearly at all.

MEMBER STETKAR: Right.

MR. TOMKINS: It's pretty much full.

MEMBER STETKAR: You had two minutes on the CST at time zero to two minutes. Then it gets too hot for the temperature. I think it's the bearings, isn't it?

MR. MOOKHOEK: Yes, it is. And we shift to the CST. We expect to stay on the CST for, what, 40 hours.

MR. TOMKINS: 36.

CHAIRMAN CORRADINI: Oh, I'm sorry. I have it backwards in my head. Excuse me. Okay. I'm sorry.

MR. MOOKHOEK: You good?

CHAIRMAN CORRADINI: I'm good.

MEMBER STETKAR: Let me ask you a couple of questions. Let me get the easy one out of the way first.

When you go back to the CST, you got about 15 pounds overpressure in the suppression pool at that time. So, the RCIC suction line is pressurized to about 15 pounds.

There's a check valve in the line. You're an operator. You know the check valves aren't always a hundred percent tight.

There's a check valve in the line that's basically going to put 15 pounds on the disk of the CST suction valve that I'm now asking an operator to open manually.

Can they do that, the 15 pounds DP across it? Have you thought about it? I mean, if the check valve is absolutely perfect and it doesn't leak, that's okay.

Otherwise I got to shut RCIC down, let the system depressurize and restart it. Now, you have no problems doing that if it works.

MR. MOOKHOEK: Not knowing the kind of valves we're talking about right at this point, it could go either way.

MEMBER STETKAR: Okay. You have no problem shutting RCIC down and restarting.

MR. MOOKHOEK: No.

MEMBER POWERS: Remember, RCIC doesn't have to be running continuously at that point in time. So, you couldn't -- one option would be to shut it down. Hit the switch.

CHAIRMAN CORRADINI: Can I take you back to that? So, you switch RCIC from the CST to the wetwell earlier. And then you switch it back to the CST at 10 hours.

MR. MOOKHOEK: Correct.

MEMBER STETKAR: It switches automatically now. Auto on high wetwell level, your terminology, switches RCIC. It does it before the operator. So, they didn't do it.

CHAIRMAN CORRADINI: And that's approximately how many hours in?

MR. MOOKHOEK: No, two minutes.

CHAIRMAN CORRADINI: Oh.

MR. MOOKHOEK: A few minutes.

CHAIRMAN CORRADINI: So, it's a very -- it's a very small change in level.

MR. MOOKHOEK: Yes.

CHAIRMAN CORRADINI: Okay. Got it.

MR. TOMKINS: 7.1 to 7.2 or something.

CHAIRMAN CORRADINI: About two inches. That's a lot of water though.

MR. MOOKHOEK: It happens -- we originally thought that it would take longer. But once we did the MAAP runs, we found it surprised us that it actually changed that fast.

So, we run the first part of it on the suppression pool. Then we shift to the CST, essentially, for the longer duration time.

CHAIRMAN CORRADINI: Okay. Got it. Thank you.

MEMBER STETKAR: I went back and there were a lot of references back and forth to Section 19E of the ABWR DCD, the certified stuff.

Section 19E, for reference, is the station blackout without CTG. So, it sounds a lot like this at least as far as RCIC is concerned.

The question I had, I'm not a thermal hydraulics guy. So, please listen, Dr. Corradini, sir.

In the Section 19 analyses, it said that the CST -- the RCIC would be realigned to the CST about four and a half hours, 4.4 hours into the event. And that the COPS ruptured disks would open about 32 hours into the event.

And now, I'm having problems with heat balances because if the temperature gets too high within four and a half hours in the Chapter 19 analyses, why do I operate 10 hours before the temperature gets up to 250 here?

So, that's like six hours more. But here, my COPS rupture disk opens about 12 hours earlier than the other one.

I don't understand what's going on with the heat. Are they completely different analyses?

MR. MOOKHOEK: We noticed that, too. Number one, the analysis for the DCD was done with the Terry turbine. They used a different pump in Chapter 19.

MEMBER STETKAR: And different temperature as far as switchover or -- I assume it was different flow rates.

MR. MOOKHOEK: Well, the pump itself and, in fact, (coughing) it assumes that RCIC fails in eight hours. But that was because of --

MEMBER STETKAR: Yes, but this is -- I'm not -- okay.

MR. MOOKHOEK: Yes, but the pump limit, the limitations on that pump with it being oil cooled, temperature-wise I believe it was -- it couldn't --

MEMBER STETKAR: It couldn't get up to 250?

MR. MOOKHOEK: Right.

MEMBER STETKAR: Okay. That explains the

shorter -- that explains the shorter time on that, but what about the COPS? Because that's --

MR. MOOKHOEK: It surprised us. When we --

MEMBER STETKAR: That's just energy.

MR. MOOKHOEK: Yes. When we went through and did the MAAP run, in fact, we had -- Toshiba did the analysis for us. And then Jim wound up doing a confirmatory on his own. So, the two separate folks, they came up with 20 hours.

MEMBER STETKAR: Came out with the 20 hours?

MR. MOOKHOEK: Yes.

MR. TOMKINS: I think one thing that may, but I can't prove it, because there isn't enough detail in the DCD to look, but I think that DCD analysis that was done by GE, they had sprays.

MR. MOOKHOEK: They used sprays.

MR. TOMKINS: They used sprays.

MEMBER STETKAR: Oh.

MR. TOMKINS: That's how they kept the pressure down. They didn't say it.

MEMBER STETKAR: Yes, they certainly didn't say it.

MR. TOMKINS: If you look at some of the level increases, it's consistent with sprays.

MEMBER STETKAR: I didn't look at -- I don't even actually remember if level was in there. Was it? I was looking for levels.

MR. TOMKINS: There wasn't level, but there's mass.

MEMBER STETKAR: Yes, okay.

CHAIRMAN CORRADINI: So, you're getting there from a combination of heating the wetwell up and essentially just adding more incompressible fluid to the system to pump out the pressure until it started opening at 20 hours.

MR. MOOKHOEK: Essentially, we don't cool down the air space, yes.

CHAIRMAN CORRADINI: I'm sorry?

MR. MOOKHOEK: We don't cool down. We don't spray.

MEMBER STETKAR: You're saying you believe they were spraying it.

MR. TOMKINS: It's our suspicion.

MEMBER STETKAR: That's a big difference.

MR. TOMKINS: It is a big difference.

MR. MOOKHOEK: But in our case, having COPS go earlier is better.

MEMBER STETKAR: Oh, yes. I'm just -- what I'm trying to understand is what uncertainties there are in these times, because times are kind of important on this.

And if it's uncertainties because of one person doing an analysis under some assumptions and another person doing nominally, you know, the same analysis under somewhat different assumptions, if you get, you know, the difference of 20 hours versus 30, whatever it was, 36 or 32 hours, you're saying that you believe that there was something fundamentally different going on in that other --

MR. THOMAS: We did not try to match that analysis.

MEMBER STETKAR: Yes.

MR. THOMAS: We prepare our own inputs and own model for that analysis.

MEMBER STETKAR: Okay. Okay.

CHAIRMAN CORRADINI: Keep on going.

MEMBER STETKAR: That's a good story.

CHAIRMAN CORRADINI: Keep on going.

MR. MOOKHOEK: So, again, we expect COPS to operate at about 20 hours to start cooling containment. The design-basis flood dissipates to below grade level at 20 hours. So, at 20 hours we have access around the power bar.

We expect the offsite equipment to be at the staging area in 26 hours. 24 hours is what they guarantee. It may be a little sooner, it may be a little, you know, before that.

We have not yet selected the staging area. We expect it to be in Bay City. We --

MEMBER BLEY: We're just a little -- you got to keep them out until the water is gone.

MR. MOOKHOEK: Correct.

PARTICIPANT: For that one scenario.

MR. MOOKHOEK: For this scenario, we need to keep them out until the water is gone. We allowed six hours to get that equipment from By City to the plant and essentially hook it up.

Once we have it hooked up, we'll actually start those generators. We'll power two of the class load centers. We'll start ventilation, which will start battery exhaust fans. And then we'll start battery chargers.

Once the battery chargers are back on, we can go through a process to restart the computer system.

Again, none of these procedures have been written yet. The detail is not there as to how we would go do that. But having been through a deenergization of a Class 1E bus for a couple of reasons, it is a deliberate action on how you bring that power back. And I would expect that's the way you would do it.

Again, at this point we still have no AC power. We're working on DC power. So, we wouldn't expect a lot of actuation, shall I say, because there's still no AC power.

Once we ever get AC power back, that's going to be, again, very challenging and deliberate as to how you --

MEMBER STETKAR: You have 480 volt AC power.

MR. MOOKHOEK: On the load centers only. So, we're picking up those load centers and the MCCs.

MEMBER STETKAR: And some MCCs, which have vales in it that will move.

MR. MOOKHOEK: Right. Yes.

MEMBER STETKAR: Or could move.

MR. MOOKHOEK: Could move. Like I said, none of those procedures, those implementing procedures have been written.

MEMBER STETKAR: Yes.

MR. MOOKHOEK: Once we get the battery chargers up and running, one of the next major things would be, you know, I've got ventilation. Now, we'll operate it in smoke purge. There's still no cooling other than smoke purge and straight through ventilation. We'll look at shift in command and control back to the main control room.

At any time during the event we can initiate makeup to the spent fuel pool with ACIWA. It will actually be running initially. That diesel fire pump will start on the loss of AC power and it will just be sitting there recirc'ing the fire water storage tank.

We will be doing the valve lineups to shift to ACIWA earlier in the event than it's actually needed.

Next slide. So, at the time we get the offsite -- get into Phase III, we'd still be on RCIC. We expect to shift to ACIWA when necessary and we deplete the water in the CST.

Will restore normal AC service. That will be one of the major things that the maintenance crews will be working on is to get a diesel back or get one of the CTGs back.

Again, we talked a little bit about ACIWA. It's got a minimum of 36 hours of fuel supply, but there's several diesel fuel oil storage tanks in close proximity to the fire protection system and each one of those tanks holds thousands of gallons of fuel. And we have a portable pump and generator staged in two of the diesel rooms to transfer fuel oil to the ACIWA.

For extremely long duration if we still don't have any issue or have any success in getting AC power back, we can actually -- we will be putting in a permanently mounted subsurface crosstie between the fire protection system and the Unit 3 ultimate heat sink basin.

So, we want to be able to shift that ACIWA pump to that 16 million gallons of water that's sitting in the ultimate heat sink if necessary.

We also obviously since the site will be accessible at that time, we would have the capability of bringing in tanker trucks as an alternate.

We will keep the spent fuel pool filled as needed. Once we get normal AC power, we will be able to restore normal cooling functions and reestablish the normal ECCS systems.

Next slide. This event had time critical steps. And I'll save time. "Critical" is kind of tongue in cheek, because there's a lot of margin here, but we're going to write the procedure such that in 30 minutes they declare the ELAP and go into the event.

That gives us 30 minutes to do the load shed and to shift command and control to the RSS system.

MEMBER STETKAR: So, there's going to be a lot of people running around the plant in that 30-minute time period.

MR. MOOKHOEK: Yes and no, yes. The nice

thing about the ABWR is the way it's designed, the RSS has its transfer switches right there. We can enable its equipment right there.

The load shed on the batteries essentially turns off the computer systems. So, what I used to experience with a PWR on an analog system running around and turning all those switches, we really don't have to do a lot of that with this design.

MEMBER STETKAR: When I say that, you know, it's a bit -- but you're basically relocating your license crew and the supervisors to the RSS.

MR. MOOKHOEK: Supervisor and a reactor operator.

MEMBER STETKAR: Yes. At the same time, sending out a couple of local operators to do the load shed, and another guy to go to the RCIC Room.

MR. MOOKHOEK: Correct.

Next, please. In developing this plan, we did use MAAP runs. We actually also went to the simulator in Charlotte. Toshiba does have an ABWR simulator.

We went over and to the best extent possible, we had to override and pull some things, but we tried to run this scenario. And we were able -- successful enough in doing that to realize that from an operator's standpoint, this is not a very challenging event.

This is slow-moving. It takes a fair amount of time to pressurize and depressurize and to fill and blow-down. So --

MEMBER STETKAR: But I'll come back to Dr. Bley's statement that that's fine standing around a simulator where the ceiling hasn't fallen in or, you know, half the site is washed away.

MR. MOOKHOEK: I agree.

MEMBER STETKAR: These events aren't going to happen that way where it's a fairly non-interesting event.

MR. MOOKHOEK: There will be a lot going on and there will be a lot of stress, but the thing that surprised me is that it doesn't occur really quickly. The BWR gives you -- it's kind of forgiving in that event more so than a PWR.

MR. THOMAS: We were concerned with how fast is an operator going to have to start RCIC? How fast is the depressurization? How fast is the vessel going to be blowing down? How fast is it going to pump up? Are we going to be scurrying around?

And, quite frankly, I don't want to oversimplify this thing, but it was kind of like watching grass grow on the simulator.

It's a very slow event in terms of how quickly do you need to put people in a place to respond to it. There's adequate time to perform these actions. And that was our purpose in going to the simulator to check the timing on some of the operator events.

MEMBER POWERS: When you look at these analysis deals, I'm thinking particularly in MAAP, this isn't a very challenging MAAP, very hard, because it's mostly moving liquid backwards and forwards, but still it kind of has its own peculiarities.

Did you perturb it a little bit to see, for instance, you said I'm going to stay on the CST for a couple of minutes and then I'm going to switch to the sump, you know? How confidently does MAAP give you that number of a couple of minutes?

Is it two minutes plus or minus 30 seconds, or two minutes or five minutes kind of range sort of thing?

MR. THOMAS: I would say we ask questions about the folks who did the MAAP analysis on those things that we felt were crucial to the analysis.

MEMBER POWERS: Yes.

MR. THOMAS: And, quite frankly, we didn't find anything in there that was particularly alarming in terms of what if it's this or what if it's that. Does it make any difference into how we build the scenario?

We challenged it in that regard. But in terms of doing iterative runs to test it for different results, we didn't do too many of the --

MEMBER POWERS: But it's not -- it's not pressing the -- it's not pushing the part of the code that's uncertain, because it's just moving hot water.

MR. HEAD: Do you really think that two minutes is important? That little swap are really almost irrelevant.

MEMBER POWERS: I'm using that just as an example --

MR. HEAD: I understand.

MEMBER POWERS: -- of, you know, when you rely -- any time you're relying on a computer code like MAAP, I mean, it's a systems level code. It has a swap and it's better at predicting trends than it is --

MR. THOMAS: We did a few hand calculations to check some things that we thought, you know, does this give us the right answer?

MEMBER POWERS: Yes.

MR. THOMAS: Do we -- it seemed reasonable, but we did not run a bunch of iterations to challenge that.

MEMBER POWERS: I mean, it's not clear. You get into the hard wired part of MAAP on this. If anything, it's just moving hot water.

Similarly on your simulator runs, did you perturb your scenario at all?

MR. THOMAS: Yes. I had fun with that.

MEMBER POWERS: Well, it's not fun. It's, again, when you take this thing and say everything is dead, now what do I do? Okay. Well, that's one scenario.

Now, what if only half of it is dead? That's a very different scenario there. And that's the scenario that can lead to operator confusion.

MR. THOMAS: Right.

MR. HEAD: We were kind of limited on the simulator capabilities. It didn't have the full plant model.

MEMBER POWERS: Yes. I mean, that's the kind of stuff you're going to have to think about when you write your procedures.

MR. HEAD: Well, we will have a full plant-specific simulator at that time, too, that we will do that.

MEMBER POWERS: Right. Only some fraction of it is dead. That's the hard, I mean, just coming up with all those different possibilities.

MR. THOMAS: And by "some fraction," you mean some fraction of the -- from the electrical capability?

MEMBER POWERS: Well, some fraction of X.

MR. THOMAS: Some intermediate event.

MEMBER POWERS: Something not quite as bad as bad.

MR. HEAD: Right. But at some point in time you have to say, okay, am I in ELAP or not? That's a very important --

MEMBER BLEY: And that's kind of where Dana is. Can we get in a spot where it's hard to decide? Are there some sequences of failures?

MR. HEAD: I don't think so.

MEMBER BLEY: The general one we think about is pretty clean, but --

MR. HEAD: I don't think so. I mean, it's, you know, that will be a significant moment if all three diesels and your CTG and another CTG are not working. I think the decision will be pretty clear.

If a diesel is working --

MEMBER POWERS: Then everything --

MEMBER BLEY: In another world, all of them are working except one, and one is working, but the breakers aren't quite working right and you can't get the power where you want it, you know, that will look different.

MR. HEAD: It will.

MEMBER BLEY: And you might not want to go here.

MR. HEAD: We wouldn't go here under those circumstances. It would go somewhere else.

MEMBER BLEY: Well, back to where Dana was on the MAAP and the simulator. The simulator and MAAP kind of look alike in this scenario?

MR. THOMAS: They did. We looked at some of the timing of the blow-down and depressurization and refill events and they were certainly compatible.

MEMBER POWERS: We kind of expected it. We're just moving hot water.

MR. MOOKHOEK: Next slide.

PARTICIPANT: If it's not chemistry, it's not interesting.

PARTICIPANT: People doing things.

MR. MOOKHOEK: People in front of the simulator. We were in dire straits there. Scott was running it.

(Laughter.)

(Comments off the record.)

MEMBER STETKAR: You're getting close to the end here. So, let me ask you one thing. Getting the -- blowing the thing down so you can get ACIWA working is pretty important to the basic strategy.

You hook up nitrogen bottles to -- everything I've read as the SRVs on the drawing, it's specifically to eight of the 18 valves that are ADS valves, right? Those are the only ones you can --

MR. MOOKHOEK: Two banks of four.

MEMBER STETKAR: Two banks of four, but only the ADS valves.

MR. MOOKHOEK: Yes.

MEMBER STETKAR: Okay. The operators then know that they're the only ones. I guess they would try to open the other ones and they wouldn't work, but --

MR. MOOKHOEK: And the way we ran the scenario, we just opened one valve.

MEMBER STETKAR: Okay.

MR. MOOKHOEK: And one valve does it. It will depressurize us to the point where ACIWA works and it will keep us depressurized.

MEMBER STETKAR: You got to hold it open?

MR. THOMAS: I don't think they have control functions from the RSS for anything other than the ADS valves. Those are the only valves they can operate.

MEMBER STETKAR: But nothing --

MR. THOMAS: Those are the only ones that are over on the RSS.

MEMBER STETKAR: Okay. Thanks.

MR. TOMKINS: There are three on the RSS.

MEMBER STETKAR: Only three?

MR. TOMKINS: Three on each. There's an A Panel and --

MEMBER STETKAR: Okay. Thank you.

MR. MOOKHOEK: So, we think that the -- go back one. We think we maintained the key safety functions that 12-06 asked us to do with core cooling, containment and spent fuel pool cooling.

And, again, as I said earlier, the plan we wrote doesn't credit or address a lot of the defense-in-depth that we've also added; the additional pumps, the additional water, et cetera.

Okay. Next one. We believe we are self-sufficient for more than 36 hours, Phase I. In fact, we've got enough fuel and battery capacity to go out to 72 hours if we had to.

But in the plan, we haven't really credited anything other than the Division I battery even though we have the capability to cross-tying all four. That's it.

CHAIRMAN CORRADINI: Questions from the Committee.

MEMBER BROWN: How long does it take to shed loads?

MR. MOOKHOEK: Less than 30 minutes.

MEMBER BROWN: Okay.

MR. MOOKHOEK: You've got --

MEMBER BROWN: How many people do you need to do that to do it in less than 30 minutes?

MR. MOOKHOEK: Two.

MEMBER BROWN: Two, okay.

MR. MOOKHOEK: The majority of it is right in the battery rooms in the Control Building. There is another panel out in -- so, for Division III and IV we're basic -- we're going to just open the battery breakers to shed those loads. For Division II and Division I, we will also shed specific loads.

So, we'll kill the computers off of those invertors, but then there will also be a couple other switches that we'll have to turn out in the Reactor Building.

So, that's why I say two guys. One to do the Control Building, one to do the Reactor Building.

CHAIRMAN CORRADINI: Other questions,

Pete.

MEMBER RICCARDELLA: I guess I question the logic of this whole evolution. I mean, if you had an operating plant with the standard complement of emergency diesels and they said, well, to address this event I'm going to go out and I'm going to install a combustion turbine generator that's qualified to all the newly-defined NTTF 2.0 external hazards, wouldn't we consider that an effective mitigation strategy?

And, yet, here STP has that already and they have to ignore it. I think it stems from that basic NEI 12-06 assumption of a non-mechanistic loss of all AC power.

MR. MOOKHOEK: Correct.

MEMBER RAY: Well, it may stem from the Agency's statement originally.

MEMBER RICCARDELLA: I guess maybe was 12-06 developed for operating plants, or it's applied to both operating plants and new --

CHAIRMAN CORRADINI: By guidance it's applied to both.

MEMBER RICCARDELLA: Huh?

CHAIRMAN CORRADINI: By guidance it's applied to both.

PARTICIPANT: But it was developed for

operating plants.

MR. HEAD: That's why, you know, basically our presentation was split the way it was. You heard the first half of what ABWR - STP ABWR is capable, including the CTG.

But as part of our licensing process, we needed to address FLEX as written. And we think we've done that, too.

MR. THOMAS: It goes to the last bullet is defense-in-depth. I'm not going to argue with 12-06. It sets the rules and we follow those guidelines. But as I mentioned, CTG is an incredibly significant component in the plant.

We have enhanced its capabilities even though we're not taking credit for it. And that provides us, I believe, sufficient and considerable defense-in-depth against --

MEMBER RICCARDELLA: Put it on wheels?

(Laughter.)

MR. THOMAS: I did not pay him to make that remark.

(Comments off record.)

CHAIRMAN CORRADINI: Other questions?

(No response.)

CHAIRMAN CORRADINI: Okay. So, let's take a break --

MR. HEAD: Can I ask a question, I guess. I'm sorry.

CHAIRMAN CORRADINI: You're welcome to ask a question.

MR. HEAD: Do we need to have -- was there any follow-on questions on the 480 volt/4160 now that we've seen the whole --

MEMBER STETKAR: Yeah, it still bothers me, but that's just me.

MR. HEAD: Okay. All right.

MEMBER RAY: Yeah, I didn't know you were going to cut it off. I was going to make a comment if it came to me.

CHAIRMAN CORRADINI: Well, I'm not going around the table. I'm just asking if you have questions at this point before we take a break.

MEMBER RAY: Well, I want to say something about that topic though.

CHAIRMAN CORRADINI: Okay.

MEMBER RAY: Many, many years ago long before any of this stuff that we're talking about today, we wound up deciding we wanted to have the ability to cross-connect two units electrically and there was a big controversy in the Agency about precipitating a fault so that you've lost both units instead of just one. But leaving that aside, the debate went to 4160 versus 480 volt.

And we wound up by John suggesting connecting -- cross-connecting with 4160. It's a manual cross-connect so that it wasn't -- it had to be manually implemented with cables on reels because people were so concerned about creating a two-unit fault sequence.

But there was an awful lot of feeling that it ought to have been a 480 instead of 4160 because of the concern with energizing a cross-connection that you make up like that to a dead set of 4160 volt buses. The feeling was 480 should carry you through the event and it was much less risky.

Like I said, we went ahead and did it at 4160 anyway, but it is an issue that people have discussed before.

And I don't think it's -- I was thinking about it since John made his comments. I don't think it's something that you don't want to reflect on carefully, because we had a big debate about it and decided to do it at 4160 because of the reasons that he said, which is we could power pumps that we couldn't operate at 480.

But it didn't experience a lot of debate because people thought, no, no, no, you don't want to energize a manual connection at 4160 into a dead plant. So, for what it's worth, it's been discussed before.

CHAIRMAN CORRADINI: Other questions.

(No response.)

CHAIRMAN CORRADINI: Okay. We will now take a break until 3:35.

(Whereupon, the proceedings went off the record at 3:22 p.m. for a brief recess and went back on the record at 3:35 p.m.)

CHAIRMAN CORRADINI: Okay. Let's get started. Mr. Foster is going to lead us through this.

MR. FOSTER: Yes, sir.

CHAIRMAN CORRADINI: Okay.

MR. FOSTER: Hello. My name is Rocky Foster. I'm the project manager for South Texas Project COL Fukushima mitigative strategies submittal and staff review.

Let me first start off by saying I'd like to thank the Subcommittee for this opportunity to present the staff's review on this topic.

I do speak very quickly and I do move the slides very quickly, but I want to allow you -- allow the Subcommittee at any time to stop me and ask your questions.

A lot of the material that's in these slides we've already gone through with the south Texas presentation.

So, I don't want to slow you up in that process, but I want to provide you with ample time to ask any questions that you may feel you need to ask.

Okay. So, with that, like I said, I'm the project manager. Tom Tai is our lead project manager for South Texas. He is on leave right now.

And our technical review staff, we've got about seven or eight different branches that were involved in the review process. So, we have a lot of different groups having to weigh in to look at and review what they gave us.

Again, this is NTTF Recommendation 4.2 for mitigative strategies. We'll go through our background slides using the sequence of events and things that happen. The SECY paper documents went before the Commission, back and forth to the industry.

I'd like to bring your attention to SECY-12-0025. And in that SECY paper, the orders were proposed, but also the RAIs that were associated with the different Tier 1 recommendations were put out for the staff then to issue to the applicant.

Also within that paper was NRO's position of what they were applying for the orders to our COL and our design certification reviews.

CHAIRMAN CORRADINI: You've all of a sudden became magnified and amplified, sir.

MR. FOSTER: We've just gotten bigger.

CHAIRMAN CORRADINI: I guess so.

(Comments off record.)

MR. FOSTER: So, back in the spring of about 2012 we started issuing the initial RAIs in NINA. Then came back June 25th of 2012 and started responding. And we've already presented Recommendation 2.1, 7.1 and 9.3 to the ACRS April 9th of this year.

Now, also as I go through the slides, I will summarize and bring up significant points. But if you want to get into further discussion, please stop me at any time.

Okay. What the staff used to review the submittal, the response that the applicant gave us, we used the NEI Order EA-12-049. this was the guidance of the ISG-2012-01 endorse which is NEI 12-06.

Basically, the order states that you've got to mitigate an extended loss of AC power and loss of normal access to the ultimate heat sink and provide adequate capabilities for core cooling, containment function and spent fuel pool cooling.

The order specifies a three-phased approach using installed equipment, portable onsite equipment and then offsite resources. And it specifies the equipment through the life of the mitigative strategies must be reasonably protected from external events.

These are the different review areas that the staff looked at and that we asked questions for. The phased approach, ~~at different~~ core cooling, containment functions, ~~cooling,~~ spent fuel pool cooling, power supplies, water/fuel supplies, ventilation, basically a whole laundry list that we could think of things.

And then we also used our licensing condition to make sure that we -- the applicant -- or the licensee then would address certain aspects that could not be done during the licensing.

A phased approach. We had a follow-up RAI to one of our initial RAIs on mitigative strategies in which South Texas responded that they propose a two-phased which they have discussed already with you.

Phase I basically going out to the 36-hour point using installed equipment. And offsite resources coming in for the Phase III approach at 36 hours.

36 hours is significant time according to the NEI guidance document, which requires the 24 hours. Also, we found out, too, that the onsite portable equipment that are available provides the defense-in-depth for South Texas' approach towards mitigative strategies.

And they have a -- you get a full laundry list of the installed equipment that they use for credit for the mitigative strategies. Okay. So, as far as -- the staff does find the proposed approach acceptable.

Core cooling. If an ELAP occurs during Modes 1, 2 or 3, as you know, RCIC automatically starts. It's originally lined up with the condensate storage tank within two minutes it automatically stops over to the suppression pool depending on high level alarm for it.

We did multiple audits looking at the MAAP codes. Those started back in August of 2012. We had five or six audits on different applications for the application itself.

MAAP code, we did come up with a justification that it did extend the RCIC operations from the eight hours that were in the design cert to the 36 hours that was in the mitigative strategies FLEX plan.

And that Phase III core cooling then can be swapped over to the -- I call it the aqua system, but I guess they call it the ACIWA system.

I'm from South Dakota. So, it's a little bit different in terminology. But, yes, basically when RCIC starts losing steam power, you've got to do -- okay, what are you going to do for core cooling? And that's when the ACIWA system comes into play.

If the ELAP occurs during Mode 4 or 5, you don't have any steam power. So, automatically the loss of AC, ACIWA system starts up, you can use your ACIWA system to provide your core cooling at that time.

Okay. But also, too, you may do depressurization of the reactor pressure vessel using the SRVs as in Mode 4.

South Texas Group described the RCIC system pump, which is a steam-driven turbine pump with a mono-block totally self-lubricated, 250 degree limited bearing temperature. And the long-term cooling is required by ACIWA system. And, again, we did use the MAAP codes -- or they used the MAAP codes, which we audited and came to the acceptable conclusion they have given to us.

CHAIRMAN CORRADINI: Just I'm sure you've discussed this before, but I don't remember. When you say "audit," you look at the calculations, or perform side calculations? How did you do the audit?

Just looked through the input? Look at the results?

MR. FOSTER: Yes. We did not -- as far as I know, we did not use calculations ourself. We looked at their calculations that we looked up, up at the Westinghouse Reading Room up in Twinbrook.

And, Mr. Gilmer, can you expand on that, please?

MR. GILMER: Jim Gilmer, NRO Reactor Systems. Yes, we did do a detailed look at the Toshiba calculation.

And in addition, we used the research developed MELCOR model to do our own --

CHAIRMAN CORRADINI: Okay. So, you did do site calculations with MELCOR.

MR. GILMER: Yes.

CHAIRMAN CORRADINI: Okay. That's what I was trying to understand.

MR. GILMER: And they're very much in agreement.

CHAIRMAN CORRADINI: Okay.

MR. GILMER: Except we got a little different from the two minutes for the switchover, but insignificant as far as the overall timeline.

CHAIRMAN CORRADINI: Okay. I was just curious how you did the audit. Thank you.

MR. FOSTER: Thank you. Any other questions?

MEMBER POWERS: You'd pretty much be surprised if there were any differences. This is, like I say, flow of hot water.

MR. FOSTER: For containment function and ventilation, containment function is controlled or maintained by the use of the COPS system.

It's a hardened passive vent system with ruptured disks. They actuate at 90 psig. Vents in the suppression pool to the plant stack. And then it has a radiation monitor that's powered by the Class 1Es up in the plant stack area.

COPS remains available throughout Phase I through III and is located in the Reactor Building. Provides containment cooling while ensuring containment structure integrity.

CHAIRMAN CORRADINI: You can ask a question.

MEMBER STETKAR: Thank you. Back on Slide

8, what is the staff's definition of "indefinite"?

MR. LI: Our review covers, say, for example, we looked at water supply. It extends to however long the events lasting. So, we in long term we use ultimate --

MEMBER STETKAR: I'm sorry?

MR. LI: -- heat sink water source which covers up to 30 days. And then after that, we will be able to use the well water which may bring in water from outside. So, that extends to -- well, however the events that ends up to.

MR. FOSTER: Member Stetkar, I think you have to look as to how we phrase the actual statement itself. It approaches about the offsite equipment for an indefinite duration.

So, if we bring offsite equipment in, it's going to last. You're going to use it to get to your final end point of when you're going to recover from the plant or whatever the next step you're going to have to deal with it.

MEMBER STETKAR: The statement was, in particular the design -- this is quoted from the SER: "In particular, the design includes permanent piping to allow the ACIWA system to take suction from the water volumes in the UHS basins and is discussed later in this

SER. The calculation confirms that core cooling can indeed be maintained indefinitely in this scenario. Accordingly, the staff concludes that core cooling can be maintained indefinitely." That's a quote.

Now, if "indefinitely" means 30 days, that's okay. In my term, indefinitely has a different definition. But if it's 30 days, that's okay. I'm just trying to find out what it actually means.

MR. LI: If it's last more than 30 days, that water still be able to --

MEMBER STETKAR: Yes, but your conclusion doesn't say that.

MR. LI: I think in --

MEMBER STETKAR: Your conclusion says that it could be aligned to the UHS, which I know has a 30-day capacity.

MR. FOSTER: That's right. UHS --

MEMBER STETKAR: 30 days is indefinitely, because what you said is additional activities beyond the UHS.

My point is people throw terms around like limiting, bounding, indefinite, beyond design-basis without really being very accurate in about what those terms mean.

And why is it important? It's important

because the American public reads these things and might have different conclusions about your evaluation of the safety, because they might understand those words differently than what this says.

So, if your conclusion is that indeed with the things you looked at they can maintain core cooling for as long as 30 days with no additional actions, it ought to say that. It ought not to say indefinitely, which might be determined by some as many, many, many years.

MR. FOSTER: Well, I think if you have enough tanker trucks and enough fuel oil, you could go many, many, many years. I mean, that's what we're --

MEMBER STETKAR: But your analysis --

MR. FOSTER: You haven't put a --

MEMBER STETKAR: Your analysis didn't say they can bring in additional tanker trucks to make up to the UHS. It says it can be --

MR. LI: I believe in --

MEMBER STETKAR: You might believe it. The analysis simply says they can use the UHS inventory to maintain core cooling indefinitely.

MR. LI: I believe in the SER we did clarify that.

MEMBER STETKAR: Did you? Okay.

MR. LI: It goes beyond the 30 days. The ultimate heat sink water inventory will be able to support up to 30 days. Beyond 30 days use well water and they use the water that you can take from off site.

MEMBER STETKAR: I didn't find it in the SER. So --

MR. LI: I believe in the SER we have that statement.

MEMBER STETKAR: Okay. Thank you. Sorry.

CHAIRMAN CORRADINI: That's okay. Now, go back to where you were.

MR. FOSTER: Okay. Ventilation. We looked at certain areas that were very critical during the operation.

MEMBER POWERS: On Page 32, it says the UHS basin can be filled as needed via a stored well water system or tanker truck.

Is that what he's talking about?

MEMBER STETKAR: I think that's what he's talking about.

MEMBER POWERS: A permanent piping connection to allow suction from the water volume will be installed. That's the last two sentences of that -- it's on Page 32 of 22.2.

MEMBER STETKAR: Okay. I'll look it up.

Thanks.

MEMBER POWERS: Uh-huh.

MR. FOSTER: Okay. To continue on, so ventilation we were concerned about the different conditions in certain areas of the plant to the operations.

One was the RCIC Room where the integrated plan actually states that to help with the environmental condition in the room itself, they will go ahead and open up the doorways — - stairwell doorways and also an overhead hatch which will allow for natural circulation. We weighed that against the reference DCD Chapter 3, Appendix 3I.

And we also looked at the remote shutdown system room for Phase I and the main control room for Phase III for the heatup analysis. And part of that habitability was that they would also open up stairwell doorways to allow for natural circulation.

We weighed that against Table 2D of NUREG/CR-6146, Local Control Stations: Human Engineering Insights.

Spent fuel cooling. In spent fuel cooling, they basically -- the approach is to -- the pool has a level of water at a 23-foot point and is allowed, basically, for heat removal to take it down to 10 foot.

This is during the first 36 hours of ELAP. They will monitor the spent fuel water level. And then, as you know, they'll use the ACIWA system to use any makeup if the level gets too low or to bring it up to the operating level that they want to have it at.

Likes to be maintained at least 10 foot above the top of the fuel racks. And provide makeup water for the system, water for the spent fuel pool. And Phase III -- also go ahead and provide the makeup water to it.

Okay. I'll turn this over to you now, Chang.

MR. LI: To support the function of RCIC, ACIWA, spent fuel pool cooling, assuming simultaneously ELAP and normal assets to ultimate heat sink, we review that required water sources such as from condensate storage tank, fire water storage tank, ultimate heat sinks. We review the pumps and the valves and associated power and fuel supplies, the piping connections and the reasonable protections for the equipment being relied on for mitigation strategies.

So, following that process, I would look in Phase I as applicant already presented. They use their suppression pool, condensate storage tank and then goes into Phase III, use the water from ACIWA system, taking water from fire water storage tank initially.

And in the long term, it used water from ultimate heat sink. The ultimate heat sink can be filled as needed via restored well water system or linked truck. That's what we would clarify there.

A permanent piping connection to allow the ACIWA system to take suction from the water volume in the ultimate heat sinks will be installed.

In the review process, we ask how that connection is being able to connect from ultimate heat sink to the ACIWA systems.

They answer the questions and explain that they installed a piping system which is robust, according to what their commitment.

And the connections that in the RHR systems provides piping valves that connect ACIWA piping was the RHR Loop C pump discharge piping. Many valve permit any water from the fire water storage tank to the RHR systems.

The single ACIWA plan can provide enough flow to maintain the vessel level in both units and still have sufficient approach to provide makeup for both spent fuel pool.

And we ask them -- well, I think they addressed it in their submittal in terms of their backup pumps as provided. And they have connections outside the Reactor Building. And those backup pumps hook up to the ACIWA to fire truck pumps are trailer-mounted pump.

The ACIWA pump is designed with the minimum of 36-hour fuel supplies. And I think they have the pumps and generator that take water from fuel oil systems.

The Phase III operator when you transfer diesel fuel, that's using the -- those underground EDG fuel which will protect it from external events that need to be protected.

And in the review process, we did ask about the water piping I mentioned before. And we revised the FSAR to reflect this clarification.

And then by using all those information, we think they have sufficiently addressed the water supplies, the fuel supplies, the pumps and the valves and all the capabilities and we believe it's sufficient to support these functions, the three safety functions for core cooling, containment and spent fuel pool cooling.

The Order specifies the equipment being relied on, for example, how those pumps, valves must be protected from external B reasonably protected from external events.

And according to NEI 12-06 guidance, these must be designed to be robust. According to NEI guidance that's robust with respect to the seismic, flood, high winds and associated missiles.

And the review of the mitigation equipment and protection levels for the external events is set to at the design-basis level. I understand you have lots of questions on that.

MEMBER STETKAR: And, yet, these are specifically for things that are worse than that, whatever that is.

MR. LI: Well, that --

MEMBER STETKAR: Specifically, these are for events that are, by definition, worse than the design-basis level. Protecting them to the design-basis for events that are worse than the design-basis has never made sense to me.

MR. FOSTER: Well, then you've got to pull back from that and say, okay, well, how far beyond design-basis do we put that marker at?

MEMBER STETKAR: That's a different

question. And that's the point of what ought to be being discussed, in my opinion, subcommittee meeting, between the staff and the industry.

What level of margin do we need? Level of margin is defined differently for different hazards, perhaps.

MR. FOSTER: True. How bad of an earthquake are we looking at, or how big of a flood are we looking at, or -- correct.

MEMBER STETKAR: Can you do it probabilistically? That's a different question. The first question is defining the fact that "robust" means I am designed to the event for which, by definition, I will exceed, doesn't make any sense.

MR. LI: Yes, this position at the time where we start reviewing the -- would take the position that's established in the rulemaking --

MEMBER STETKAR: You took the industry's position in something that they wrote, is what you took.

MR. LI: I think the rulemaking --

MEMBER STETKAR: You agreed with the words in NEI 12-06 and said, yeah, that's okay.

MR. FOSTER: The Agency did take that position, yes, sir.

CHAIRMAN CORRADINI: You've walked into

generic land. You just happen to be the ones up that we can beat on.

MR. FOSTER: If you step back from the situation, okay --

MEMBER STETKAR: That's what I'm trying to do, by the way.

MR. LI: We understand.

MR. FOSTER: With mitigative strategies itself, you can design to certain levels. And you can do this probably fully informed, right?

We know with these advance reactors we do have built in margins. They all do in all different areas, okay. That's proof from the studies and the calculations they've done and whatever.

But with FLEX, if you can't -- if you don't come to a final definition of how bad the situation is, you can put programs in place to address it using different strategies then.

Some equipment will survive. If that's installed, that's great. You have backups to it. You have flexibility of where you have global onsite equipment at. And then provisions in place for offsite resources to get there to assist you to final build a combat of the situation you've got.

CHAIRMAN CORRADINI: I think we're just

trying to evoke some discussion, because I think at least for this particular case given the fact they've stuck a plant on a site that's a tad more robust than the site requires, gives me a lot of confidence and I'm not concerned about this plant at this site.

On the other hand, I think where John is going with this, it's just kind of interesting that at 0.13 it all stops. It's not 0.15. It's whatever.

MEMBER STETKAR: Yes.

CHAIRMAN CORRADINI: I'm doing this so that I can get Pete to say something. Pete.

MEMBER RICCARDELLA: If you design to 0.13 or a spectrum that goes through a peak ground acceleration of 0.13, you clearly have margin for larger earthquakes.

MEMBER STETKAR: And that's my whole point is how much margin for --

MEMBER RICCARDELLA: In fact, I mean, if you look at the CEUS plants and the new response spectra that have come out, you've got plants that are a factor of two or three times B have response spectra that are two, and in some cases three times what the original SSE was for the plant. And what are they going to do?

I don't think they're going to change equipment. They're going to go back and they're going to do a margin analysis or they're going to do a seismic PRA.

MEMBER STETKAR: Nothing wrong with doing that, but I don't see people doing it.

MEMBER RICCARDELLA: So, I mean, the fact that they design to the newly-defined site hazard, to me, tells me that they've got the ability to evaluate this equipment to show that while in reality if I really need it, it can take --

MEMBER STETKAR: On the other hand if I take this particular site, if I design to 0.13 g, typically what we see a lot of, and there's variability, is that the HCLF capacity when I look at fragilities, is typically around where you design where typical comes out. At least I've seen that.

MEMBER RICCARDELLA: What capacity?

MEMBER STETKAR: HCLF, high-confidence low probability of failure. One percent probability of failure is -- if you look at typical margins that are built into things, people when they've done the analyses, tend to come out and say, yeah, I mean, it might be higher than -- might be 0.15. Might be 0.17.

The median capacity in a -- if I look at the typical uncertainties is about anywhere from two-and-a-half to three times higher than the HCLF capacity.

So, if I'm looking at a 0.15 g HCLF capacity, I'm looking at about a 0.4-ish, 0.45 g median capacity, which means there's a 50 percent chance that the thing fails at that capacity.

Now, what's my margin? Well, if I were to get a 0.5 g earthquake, there's a 50 percent chance that the stuff designed for 0.13 g would fail.

There's a much lower chance that the stuff designed for 0.3 g would fail, but I can't take credit for that stuff. I can take credit for the stuff that has a much higher likelihood of failure.

MR. FOSTER: Okay. I think --

MEMBER STETKAR: And that's the notion of how much confidence do I have in the margins for the stuff that's on the site.

The stuff you're flying -- the stuff that's not on wheels, you know. Use the term "on wheels." The installed equipment. Whether that installed equipment is something like RCIC, is part of the original plant design, or the switchgear that you're plugging stuff into, or whether the installed equipment is -- well, ACIWA is part of the original plant design here, but other installed, fixed equipment that might be part of a strategy, not on this plant.

MR. FOSTER: Okay. Can we allow Mr. Bowman a chance to speak and maybe provide some insight on 12-06?

CHAIRMAN CORRADINI: We'd welcome it.

MR. BOWMAN: Thank you. I'm Eric Bowman. I'm a special advisor in the Lessons Learned Division in the Office of Nuclear Reactor Regulation.

Some of the background on why the levels were set at the design-basis level is really related to the direction we got from the Commission in particular in the SRM to COMSECY -- or to SECY-11-0093 in which the Commission told us to pursue the NTTF Recommendation 1, which had included the establishment of an extended beyond design-basis limit independently of all the other recommendations, including Recommendation 4.2 which resulted in the Order EA-12-049.

Tomorrow the full committee will be hearing a presentation on the integration of the reevaluation of at least the flooding hazard under Recommendation 2.1 activities with the Recommendation 4.2 EA-12-049 activities and the associated rulemaking in which we'll be looking at seeking Commission affirmation that the end result should be setting the level of protection for the FLEX equipment and mitigating strategies to the reevaluated hazards.

But we were constrained by the direction that we were provided by the Commission as to what we could do for setting the necessary hazard levels.

MEMBER STETKAR: I happen to be reading that SRM right now and I don't actually see --

MR. BOWMAN: It's the last paragraph that says, pursue Recommendation 1 separately. And you have to go to SECY-11-0093 itself to see -- Step 1.1 of Recommendation 1 was the one that recommended that the Commission draft a policy statement for an integrated risk-informed defense-in-depth policy including specifically extended beyond design-basis regulations.

MEMBER STETKAR: Okay. Thanks. It's on the record. It's a stretch to me, but that's okay.

MR. FOSTER: Any other questions?

MEMBER STETKAR: No.

MR. FOSTER: Okay. We'll continue on then.

CHAIRMAN CORRADINI: Okay. We got out two cents in.

MR. FOSTER: Yes, sir.

MR. LI: We review the -- verify that the installed RCIC, ACIWA and the seismic qualified and compare with robust structures with adequate protection against --

MEMBER RAY: You said "adequate." I don't think you meant that, did you?

MR. LI: "Adequate protection" is the wording that's put --

MEMBER RAY: I know. I'm just looking at the screen up here. Do you mean to say adequate protections? It says "reasonable protection" up there.

MR. LI: Reasonable protection, yes. Sorry.

MEMBER RAY: That's an important difference.

MR. LI: Yes. Reasonable protection.

And we verify that those ACIWA valves, those connections in RHR loops and the batteries are in the units. That's either Seismic Category 1 structures are the enhancement that the applicant committed to view to be robust.

MEMBER STETKAR: Can you guys do me a favor when you write the final SER, to avoid the confusing term "Seismic Category 1"? Because in the first bullet, it is 0.3 g Seismic Category 1. And then in the third bullet it's 0.13 g Seismic Category 1.

That's just -- it's very, very confusing to someone who reads this. If I were to read this looking at the bullets, I would presume that the UHS is designed to precisely the same seismic acceleration as the Reactor Building, and that's simply not true.

MR. FOSTER: Okay.

MEMBER STETKAR: So, either always use the term "site-specific" when you're talking about the site-specific, but just don't throw around -- and it's not just done on this slide. It is done actually in the SER.

The justification is this is a Seismic Category 1 structure. These are Seismic Category 1 equipment. There's two different Seismic Category 1s for this plant.

MR. LI: Thank you. That was a good comment. Going to change that.

And ultimate heat sink is Seismic Category 1. That's in the design. Based on all these verifications confirmed, the staff finds the equipment being relied on for the mitigation would be reasonably protected from external events.

(Comments off record.)

MR. FOSTER: Okay. The power supplies for the submittal as NINA presented earlier, we have four Class 1E 125 DBC divisions, one battery per division.

One non-Class 1E 120 volt DC battery, and another one non-Class 1E 250 volt DC battery.

Phase I, the only power source that they take credit for are the DC power stations, not the CTGs as was earlier discussed. And with the use of load shedding, their initial approach on this was that the battery life will last for at least 36 hours.

This load shed the battery divisions to maintain core cooling, containment and spent fuel pool cooling.

Phase III, they'll bring in the offsite resources which we already discussed the differences on the different generator system they could bring in.

Their approach is the 480 volt 1500 kV diesel generator will be brought in. And that's sufficient enough to power the loads they need for Phase III.

In Phase I, the only power source, as they said, the only things that are available are the Class 1 120 volt DC batteries. The staff reviews the battery size calculations to confirm the adequacy of power supplies.

We performed five different audits to support this portion of the review. They confirmed the battery sizing was performed in accordance with the

1EEE Reg Guide 1.212.

The battery duty cycle, the loads of corresponding timeline. They ensured the minimal battery valve voltage is met. The environmental conditions of the battery room, and the list goes on and on, on different things in the area that we looked at.

What it comes down to is they assured the batteries could support a duty cycle greater than the eight-hour qualifications.

MEMBER BROWN: Why is it only eight if you need 36?

MR. FOSTER: I'll defer that to staff.

MEMBER BROWN: She's leaving.

(Laughter.)

MS. MARTINEZ-NAVEDO: Yes. My name is Tania Martinez from the Electrical Engineering Branch. The eight-hour mark is the actual duty cycle for a battery. And it's the basis for 485 battery sites in calculation. That's the example.

Not to say that the sizing calculation method can be used for extended duty cycles, but the operational experience for the U.S. is based on the eight-hour duty cycle.

That's why that eight-hour duty cycle

number is used, but the calculation method can be used for longer duty cycles.

MEMBER BROWN: I know, but they're taking credit for 36 hours.

MS. MARTINEZ-NAVEDO: Correct.

MEMBER BROWN: And you say all you audited for was to make sure they would make greater than eight hours, which seemed to be a little bit inconsistent.

The second thing, I looked at your audit reports and in there you said, you know, I looked at even the June, whatever, 2014 and it said you reviewed all their stuff.

Did you all independently do the calculation against the IEEE standard for how they came to their conclusions with their battery profile -- or with their load profile?

MS. MARTINEZ-NAVEDO: We audited their calculation and it's basically -- it's a tabulated version of the calculation that follows Appendix A of 485.

We did go line by line because you have to break the duty cycle by the loads, depending on the timeline. So, we did go one by one to verify that the duty cycle or the battery capacity could cover the length of the duty cycle and the demands of the loads.

So, we didn't do the calculation ourselves, but we did look at all of the numbers in their tabulated calculation.

MEMBER BROWN: Okay. There's two parts in their FSAR. Section 1.18.4 is their discussion of the loading considerations.

They say as discussed in 2.4, the ability of the division of one safety-related battery was evaluated to support the required loads, et cetera, et cetera.

And then they go through a bunch of paragraphs, but they never say 36 hours anyplace in the FSAR that they needed a sizing, they needed to size the batteries in the extended period for -- I don't find 36 hours anywhere in here other than one specific reference to non-Class 1E batteries to power radio communications for 36 hours.

MR. FOSTER: In Part 2, Chapter 1, Appendix 1E.

MEMBER BROWN: 1E, yeah. So, you know, I thought their FSAR would have provided a metric for saying since we credit all these, then whatever we do with our batteries -- somewhere in here the 1E batteries should be specified as being able to be covered for 36 hours. It's kind of a loose end.

I went back and looked at Section 2.4. Didn't say anything there.

MR. FOSTER: The integrated plant itself.

MEMBER BROWN: I looked at the FSAR.

MR. FOSTER: Well, the --

MEMBER BROWN: The FSAR they modified, they revised the FSAR to cover the need for extended life on the batteries, but they don't talk about what the extended life is -- should be. That's my only point.

MS. MARTINEZ-NAVEDO: Yes. And just to clarify, we did --

MEMBER BROWN: I understand. I just wondered how fine tuned you went down through the ~~voting~~ auditing.

MS. MARTINEZ-NAVEDO: Okay.

MEMBER BROWN: The reason for that is personal experience where we had a contractor who said that they followed an IEEE standard, they calculated X, Y and Z, came to a conclusion.

When myself as an independent contractor went back and looked at it, they neglected to use three of the correction factors that were within the IEEE standard, because they didn't think they were relevant. And they ended up with the wrong answer.

So, that's why I ask how detailed your question was. And I'm not familiar with that IEEE standard that much, because I don't have a copy of it. That's why I asked for a level of detail. So, thank you.

MS. MARTINEZ-NAVEDO: Okay.

MEMBER BROWN: Other than that, it was just a disconnect. The FSAR ~~SR~~ seems to be silent relative -- at least in the 1E, relative to the Class 1E batteries. I couldn't find it.

MR. MOOKHOEK: Bill Mookhoek. We actually incorporated by reference the FLEX plan. We consider that as part of the FSAR.

MEMBER BROWN: Is that in the FSAR?

MR. MOOKHOEK: Yes. Yes, it is.

MEMBER BROWN: Where?

MR. MOOKHOEK: In Section 4.2, we actually B

MEMBER BROWN: 1E 4.2?

MR. MOOKHOEK: That's correct -- or 2.4.

MEMBER BROWN: 2.4?

MR. MOOKHOEK: 2.4 for the FLEX plan.

MEMBER BROWN: Okay. I looked at that. I didn't pick that up.

MR. MOOKHOEK: And it actually says that the detailed scenario, the integrated plan is described in that separate document.

MEMBER BROWN: That should be at the beginning?

MR. MOOKHOEK: It's -- I don't have a -- it's in one of the paragraphs.

MEMBER BROWN: 2.4.

(Comments off record.)

MR. MOOKHOEK: It's probably after --

MEMBER BROWN: I'll look. Go ahead. Go ahead. I know how to look.

MR. MOOKHOEK: That was our intention. That plan is actually going to be covered as part of the FSAR and under the same change process.

MEMBER BROWN: So, I ought to be able to keyword "incorporated by reference" and find --

MR. MOOKHOEK: I don't think we used the word "incorporated by reference." We used "described in the FLEX integrated plan.

MEMBER BROWN: Okay. All right. Go ahead.

MR. FOSTER: Thank you, sir. Now, we'll turn it over to Mr. Tom Scarbrough for the mechanical part of the review.

MR. SCARBROUGH: Thank you. I'm Tom

Scarbrough. I'm in the Mechanical Branch. We looked at several aspects of their FLEX plan, their pumps and valves, which ones are safety-related, non-safety-related. We asked a series of RAIs that we've done for Vogtle and, you know, other ESBWR, Fermi.

What we're doing here was in the first RAI, which was RAI 01.05-24, we asked about the performance requirements for the safety-related, non-safety-related and portable equipment.

And the response from NINA, they indicated that safety-related pumps, valves and snubbers used in the mitigative strategy are permanently installed equipment and not relied on to perform functions beyond those credited in design-basis, except for the RCIC suction where they are going to allow the suppression pool temperature to increase up to 250 degrees Fahrenheit, which is the qualification for the RCIC pump bearing. So, that's a limitation that is different than what the original was.

So, that's the type of thing we ask for when we ask about is there anything -- even though it's safety-related, there may be some scenarios or aspects of the FLEX response that goes beyond what was currently reviewed and approved as part of the original DCD or FSAR.

So, we have a confirmative item which will track the revision of the RCIC piping expansion calculations for the FSAR for that.

For the non-safety-related equipment, the strategy, they are permanently installed and are not relied to perform any functions beyond those already specified in the DCD or the FSAR.

Now, for the pumps, there's two portable pumps that are used to transfer the fuel oil from the ACIWA, the ACIWA system, the fuel oil storage tanks up to the B from the diesel fuel oil storage tanks so they can have fuel oil for those -- for the equipment. So, that was the performance requirements in terms of what we evaluated in that respect.

And then once we found out where the performance requirements were, we would ask about each type of equipment in terms of how we would qualify tests, you know, what would your process be for that.

And so, for RAI 25 we asked about, okay, for safety-related equipment, this will be the RCIC. What's your qualification process? What, you know, what process are you going to use?

And they specified that it's indicated in the DCD and the FSAR, for example, Appendix B, the IST Program, all of those have to be followed for that.

Now, we did find that the RCIC net positive suction head margin was acceptable, but they did have increased suppression pool temperature and containment overpressure to be able to reach a RCIC margin -- head margin.

And so, we explored that and we asked about, okay, what's your basis for those assumptions that the RCIC net positive suction head was going to be acceptable?

And they ended up with like about 8.4 feet of minimum net positive suction head margin at eight hours. And so, we're saying, okay, that's kind of close. What's your assumptions for there where you came up with that?

The net positive suction head required is based on full RCIC flow. And after eight hours, it's going to be dropped down quite a bit. So, there's some margin there.

The friction head loss that they assumed was more at nominal temperature and with the increase in the suppression pool up to, you know, up toward 200 degrees or so, you're going to have a higher temperature, you're going to have a -- less friction head loss there. So, you have some required NPSH margin there.

And then for the RCIC pump vendor, they indicated that the pump vendor, their assumption of 23 feet assumed net positive suction head required, this pump, as we talked about, has a better performance than that. So, we'll probably have some margin there.

So, there was some margin with their net positive suction head. Even though it was 8.4 feet, we consider it to be reasonable.

Nevertheless, we had them adjust their FLEX plan in case they did start to observe some cavitation in their RCIC pump that they could shift back to -- from the suppression pool to the condensate storage tank early if they needed to because they're going to switch anyway about 10 hours.

And so, the minimum net positive suction head occurs about eight hours. So, it would have a switch a little early if they got to a point where, as we heard earlier today, they have someone in the RCIC room monitoring those pumps. And if there's a problem, then they'll switch early.

So, they do have the process to if they lose RCIC entirely, they can reduce reactor pressure and then shift all the way over to the ACIWA system. So, they can do that as well.

So, that was some of our questions

regarding the qualification for the RCIC in light of the fact it is going to have somewhat different performance than during sort of the standard safety-related that was accepted in the DCD.

For non-safety-related equipment, the ACIWA system is part of the fire protection system which has its own additional requirements. And all of the requirements are described in DCD.

We looked over the sections in the DCD related to this. The testing is performed in accordance with the fire protection program, the maintenance rule program. It's part of their -- the D-RAP, Design Reliability Assurance Program, and the maintenance rule.

It's also seismic qualified and we'll need to make sure we -- make sure that's clear in the SER which level of g it is, but we'll make sure that's clear. It's also in robust structures.

The fire protection system also includes pre-operational testing per Chapter 14. There's pump and valve testing specified for that equipment.

And then as part of the QA program, there's a special section of the South Texas 3 and 4 QA program which deals with non-safety-related equipment. That's high importance and this would fall into that.

So, those are some of the aspects that we looked at in terms of the capability of that non-safety-related equipment.

And then for the portable equipment, as we mentioned, the only portable equipment are those two 120 volt pumps that are used to transfer fuel oil.

They're going to be commercial grade, but we explored with them through this RAI how that process is going to be accomplished for this equipment.

In their procedures, there are specific requirements that they develop a determination of the critical characteristics for the commercial grade item, make sure it's suitable.

So, it's very similar to what's done for safety-related commercial grade dedication. And there's a quality evaluation that's performed as part of that as part of the operational program. So, that was the performance capability evaluation for the portable equipment.

And then we asked them about the operational programs, because there is some discussion of that. And we wanted to see sort of where this all fit into the program. And they would develop a separate program for their FLEX equipment, or incorporate it into their programs that are already listed in Section 13.4S.

And there's a number of them there. For example, the fire protection, maintenance rule, motor operated valve program, initial test program and those are all specified.

And then lastly, there is a plan license condition which will have the administrative program for the configuration control, the maintenance, the testing of the equipment for all of this mitigation strategy.

So, based on that, we agreed that the basis for this equipment has been demonstrated and there's going to be a license condition. And also, there will be inspections conducted as part of the ones that are related to ITAAC or ones that are related to the normal - - the operational program in the inspection procedure for function design qualification and in-service testing of pumps and valves and restraints.

There are provisions in there for equipment that's RTNSS and for safety-related and RCIC would be in there. So, we'll have an opportunity to verify that they follow through on these procedures and these processes for qualifying this equipment and establishing testing for them.

MEMBER STETKAR: One thing I stumbled

across was -- and maybe not you, because it's not necessarily mechanical equipment, but I'll throw it out anyway, a question about equipment qualification in the drywell.

And in the SER, it said that MAAP analysis results in the calculation report that the maximum drywell temperature during an ELAP condition is 332 degrees Fahrenheit, 167 degrees C, which is below the equipment design temperature of 339.8 degrees Fahrenheit, 171 degrees C.

That doesn't sound like a very big margin for a fairly large temperature increase. So, I was curious about what the uncertainties are in those two estimates and where I might get in trouble if indeed the actual temperature inside the drywell is underestimated by that MAAP calculation.

MR. SCARBROUGH: Well, in terms of their qualification, there will be design specifications which provide what are the qualification limits. And then they will have to go through a process to demonstrate that equipment.

I'm not sure which if it's ~~(coughing)~~, but they will have to have a program to validate to qualification of that equipment for that limit. That's a margin built into that.

MEMBER STETKAR: Okay. Well, that's what I'm trying to explore, because you went through a good process talking about qualification of, if I can call it that, confidence that I'd have adequate net positive suction head for the RCIC pump because of all the things we discussed a few slides ago about different designs and reduced flow rate, things like this.

I didn't see any similar discussion here. It just said, well, they ran a MAAP analysis and I came out 7.8 degrees lower in that MAAP analysis than some other temperature that's designed -- a qualification temperature, so I'm okay.

MR. SCARBROUGH: Right. I'm not sure --

MEMBER STETKAR: Without any discussion of uncertainties or why I'm confident that --

MR. SCARBROUGH: Right.

MEMBER STETKAR: -- that one MAAP analysis temperature isn't underestimated by, you know, 20 degrees --

MR. SCARBROUGH: Yes, I understand.

MEMBER STETKAR: -- out of 350.

MR. SCARBROUGH: Yes, I didn't do the review, but I would imagine that the staff that looked at that, would have looked at the uncertainties in that analysis, you know, based on their use of that program, that code.

MEMBER STETKAR: I don't know what equipment. I mean, it's mentioned in the SER about drywell penetration seals, for example, you know, are qualified to that 339.8.

MR. SCARBROUGH: Right.

MEMBER STETKAR: I don't know what happens when we get up in that range on those penetration seals.

MR. SCARBROUGH: I'm sure they have margin in terms of the -- because you wouldn't want to qualify something that was so close to the limit that if you ended up down the road that you had an adjustment of that calculation that all of the sudden you found a lot of equipment that's unqualified.

And we've had this discussion with licensees regarding motor operated valves in terms of building in margins so that in case down the road you ended up with an adjustment, a slight adjustment in your design-basis, you don't end up with inoperable valves all of a sudden because you can't justify that small increase. So, I would expect that they have margin there.

CHAIRMAN CORRADINI: Can I ask a different question -- or at least related question? So, before when we asked about an audit, MELCOR calculations were done as part of the audit.

So, in this case, did staff just look at the MAAP calculation, or did they do something to convince themselves that this was good enough?

MR. SCARBROUGH: I wasn't part of that audit.

CHAIRMAN CORRADINI: Is Mr. Gilmer there?

MR. FOSTER: Different staff member. Different branch.

MR. WAGAGE: My name is Hanry Wagage. I'm from Containment and Ventilation Branch. We looked at the MAAP calculation. We looked at the input and we looked at the results that were reasonable.

And we found that there was some margin, but we were convinced that there was some margin in the calculation because of the input chosen and we assumed that their results were consistent.

MEMBER REMPE: So, you are convinced there's margin because they used conservative input, but did you compare the results with what like temperature is for the seals like Mr. Stetkar was mentioning?

Did you look at how it would affect equipment, seals, instrumentation that are placed in the drywell?

MR. WAGAGE: We did note -- compare the -- actually, there was the limitation of the temperature limit. We compared the limit that was below the limiter.

MEMBER REMPE: I couldn't hear. I'm sorry. You looked at the limit for the seals themselves?

MR. WAGAGE: Equipment qualification template. It was below the equipment qualification template.

MEMBER REMPE: For the seals.

MR. WAGAGE: Yes.

MEMBER REMPE: Okay.

CHAIRMAN CORRADINI: Okay. Let's keep on going. You guys are close.

MR. SCARBROUGH: Okay. I'll turn it back over to Rocky.

MR. FOSTER: Okay. Our final slide on licensing conditions, this is a license action that we're doing. And we know that this is not a final design or the final build.

We're at a point where additional work will have to be done on this process and on the plant itself to come to full ~~tuition~~ fruition on it.

And so, we put licensing conditions in place to make sure that the licensee at that time would then have to fulfill -- come forward with this information.

In our license conditions, we looked at completing the entire FLEX integration plan because right now it takes that long and they have to address by plant procedures the guidance, the strategy, the installation of any type of FLEX equipment, if they do, the training programs and the administrative controls, the configuration control maintenance and testing.

And then we've got to provide a full implementation guidance and strategies for procedures, training, the acquisition, staging the equipment, installation of equipment and the configuration control provisions, procedures for maintenance and testing.

They also want them to perform habitability analysis for the RCIC room, for the RSS room and for the main control room for the different phases that we spoke about earlier.

Updated design calculations for the Class 1E battery discharge with FLEX as-built plant design. Complete an integrated system validation of ELAP timeline which is 30 minutes. You heard about the ELAP declaration. We want to see the basis for that and we ask for it to be proceduralized. And the maintenance to the guidance to the strategies programs.

Questions.

CHAIRMAN CORRADINI: So, I'm going to make a suggestion. Unless we have burning questions now, we're going to lose some of South Texas and we need to go on to the fire-induced spurious signals and we'll lose some experts.

So, if we want questions of these staff, they're going to stay. So, we can drag them back up. Is that acceptable to you, Mr. Brown?

MEMBER BROWN: Well, I mean, they're not necessary because I'm just going to go back and respond to the comment about the mitigating --

CHAIRMAN CORRADINI: Okay. But if we might go on to fire-induced --

MEMBER BROWN: That's fine.

CHAIRMAN CORRADINI: Anything burning?

MEMBER RAY: Let me say one thing quickly.

CHAIRMAN CORRADINI: Yes.

MEMBER RAY: I had a very short discussion about reasonable protection when the words "adequate protection" were used. I just want to be clear about it.

Reasonable protection is the protection afforded to the equipment. Adequate protection has to do with the protection of the public health and safety. Completely different subjects and I thought it was important that we not mix up those two. They get confused often enough.

MR. FOSTER: Yes, we agree.

CHAIRMAN CORRADINI: Okay. So, thank you. We'll let you exit off stage left and we'll bring on South Texas to talk about fire-induced spurious safety, but don't go anywhere.

(Pause.)

(Comments off record.)

MEMBER BROWN: While they're doing that, can I ask you, Bill --

MR. MOOKHOEK: Yes, sir.

MEMBER BROWN: -- on a response you said the mitigating -- that you had referenced kind of incorporated by reference, the only thing I could find was in Section 2.4 where you all specifically state in 1E that to support the implementation of the FLEX plan, the following system design requirements will be incorporated in the STP 3 and 4 final design.

And then it goes through a shopping list of about a dozen items. Class 1E batteries are not even mentioned.

MR. MOOKHOEK: Correct.

MEMBER BROWN: Only non-1E batteries. They are important, but not the Class 1E batteries.

MR. MOOKHOEK: In a follow-on paragraph, we say that the FLEX integrated plan describes the strategies and the methods to provide core cooling, et cetera.

MEMBER BROWN: Okay. Would you just let us know, tell Maitri or somebody if I'm not around, where that is?

CHAIRMAN CORRADINI: Yes, help us find it so that --

MEMBER BROWN: If that's there, that's fine.

MR. MOOKHOEK: Okay.

CHAIRMAN CORRADINI: Scott, you're up.

MR. HEAD: Okay, and thank you very much for this. We will be losing a couple of our critical players here in a few moments. And I apologize to the staff for whatever this might be doing to your evening plans.

We wanted to give our perspective on ACRS Action Item 64, which is fire-induced spurious signals from DC cabinets -- I mean digital I&C control cabinets with fiberoptic cables.

So, to do this, we're going to start this off with this diagram that comes from a, you know, it's derived from a Tier 1 figure and it will be our starting point for the discussion.

And the blue is what we've added at this point to show the different locations of some of the important features.

And Tim Hirst with Hirst Engineering is with us here today. He's basically responsible for the overall coordination of our digital I&C control architecture and the design.

And if we have any detailed questions on this, then Tim is certainly going to weigh in. And Evans you've heard from today.

So, we've broken this up in terms of what's local out in the field in terms of sensors to the left of the drawing, in the control room, and then in local.

And the important aspects of this are, I think, is that you see in the control room the SLF, basic digital logical processing information takes place. And we have fiberoptic cables, the dotted lines that are going out to the SLF RDLC that's out in local. That's out in the switchgear room or other areas in the plant where the signals are being sent out from the control room to control that equipment.

And I guess a couple of aspects of this that are important is that, you know, we don't, you know, we believe that based on the design of the architecture and the way the signals are encoded that it's very, very unlikely for a spurious actuation to be generated within the digital control system. And that's reflected in some of the DCD language.

MEMBER STETKAR: Let me stop you right there, because you've just used a term that says very, very unlikely that I'm willing to be pretty happy with if you were doing a risk-informed fire protection program, which you're not.

You're doing a deterministic fire protection --

MR. HEAD: Right.

MEMBER STETKAR: -- program which says you shall assume that those signals occur. So, just let's --

MR. HEAD: And B

MEMBER STETKAR: It doesn't say that they're unlikely. It says, I have to assume that they occur and I can demonstrate that I'm protected against them.

MR. HEAD: Okay. And so, we're going to address the -- where the spurious actuation signals are assessed per the NEI guidance on the next figure, which is the same figure that is -- but now it incorporates where we believe, in fact, where the NEI 00-01 applies with respect to spurious actuations.

And it's basically out in the field where wire occurs and spurious actuations can occur due to fires with respect to actual cabling or wire.

So, the NEI guidances we've committed to applies to your local instrumentation or local equipment out as you see on the right side of the figure there.

With respect to -- I'll say, the DCD says essentially zero, okay. It's still possible we recognize that.

And so, you have to ask, well, what happens in the control room if a fire is caught or you have a fire that takes place or a cabinet is heated?

Well, there's a number of things that will take place. One, if a cabinet is heated or is undergoing some sort of situation where maybe the lines or the vents are plugged or something, we will get alarms in the control room.

And so, we will be able to assess that, even deenergize the cabinet if necessary because there's issues with that, or if we actually see something happening.

MEMBER STETKAR: Scott --

MR. HEAD: Yes, sir.

MEMBER STETKAR: -- let me interrupt you again.

MR. HEAD: Uh-huh.

MEMBER STETKAR: You're talking about a scenario that I can quantify in a risk-informed approach.

MR. HEAD: Right.

MEMBER STETKAR: That is not part of the deterministic evaluation of fire damage. Deterministic evaluation of fire damage says you assume that the spurious actions occur and indeed the plant has adequate margin to still be able to achieve safe shutdown.

It does not say I have this thing where the operators have some likelihood of deenergizing it before or after some spurious actuations. That's not part of the deterministic analysis.

MR. HEAD: Okay. Well, I'm just saying that's not what happens in the control room. That's not what --

MEMBER STETKAR: You're right. You're absolutely right, but you don't get to -- you don't get to take credit for the probabilistic approach to life in saying, well, because I -- in truth, it's probably not going to happen that way, and also say that I don't want to do the analyses to support that.

MR. HEAD: Well, there is no analysis that we don't want to do. What the certified design says and has approved was the creation of those spurious signals is low enough to be acceptable for --

MEMBER STETKAR: Low enough to be acceptable. What's low enough to be acceptable?

MR. HEAD: We think in this case --

MEMBER STETKAR: Why can't you -- let me play the opposite side. Why can't you presume that all of the spurious signals come out of there and show that you can --

MR. HEAD: We do that on the right side, okay. On the right side of this, those signals immediately are going to end up being in cabling. And we will have all the spurious actuations take place, but on the right side in basically a division level.

MEMBER STETKAR: You use words like "all."

MR. HEAD: Sorry.

MEMBER STETKAR: And those --

MR. HEAD: I try not to do that.

MEMBER STETKAR: -- and on the right side. And having done enough fire analyses, it depends on how the stuff on the right side of this figure is distributed in compartments throughout the plant compared to how the stuff between the two dotted lines is distributed in other compartments throughout the plant.

And if I have very well-separated divisionalized stuff that's called "local" here, I have different effects when I burn that room than I do if I burn the room between the dotted lines. So, you can't draw those analogies when you say "all."

MR HEAD: Well --

MEMBER STETKAR: Because they're different alls.

MR. HEAD: So, let me say that our east division is its own fire area. That's, you know, that's the way the plant is designed. And it really won't matter where the wire is.

We believe that the wire will be in its division and its room that's in the, you know, the fire area, but it really won't matter.

The NEI guidance will cover it, cover the wire and says, if you have wire, then you need to see what happens if there is a fire.

MEMBER STETKAR: And I'm not talking about wire. I'm talking about spurious signals that come out of cabinets in through transmission pathways that are intact.

Now, in some cases those transmission pathways might be copper, in other cases those transmission pathways might be fiberoptic cables, but it's heating up cabinets that cause spurious signals.

MR. HEAD: Okay. So, we'll circle back then and then address the digital aspect of those spurious signals because that is --

MEMBER STETKAR: Now, NEI 00-01 doesn't address that. In fact, it doesn't even address cabinets, because it's all focused on the traditional bugaboo of hot shorts in wires that are formed out of copper conductors that may or may not have grounds on them and all that kind of stuff. It never thought about digital systems.

MR. HEAD: Or it did and found it unnecessary to make that an issue because digital -- spurious signals due to fire are probably orders of magnitude less than, you know, than other issues that have existed for digital equipment.

Spurious actuation, you know, sun spots, electromagnetic fields, you know, something else would be in the digital world much more likely than a fire-induced spurious actuation.

And so, that's maybe why it's not in the NEI guidance right now is that it is not a threat that -- represented by spurious actuations due to fire for copper.

And so, I'm going to ask Tim to go ahead and use that as a lead-in.

MR. HIRST: In reality, any spurious event that you could get out of the SLF ends up becoming an item that happens in the local actuation area.

The way the design is set up, there are three independent divisional electrical switchgear motor control centers. The final voting is done in those rooms where that equipment is. So, it's all in one spot.

The final connection from the mode unit to the switchgear is copper. So, therefore, as part of the analysis of the rooms and the actual controls on the switchgear and MCC will end up verifying every one of these spurious actions that can happen in its event or its impact on the plant.

MEMBER STETKAR: But you again have fallen back into places where copper exists. And I'm saying I don't care about that. I care about spurious signals coming out of cabinets.

I don't care whether it's copper or

fiberoptic cable, because you immediately said you've gone back and looked at every place in those rooms where copper wire comes, that nice solid line, those over there, and I'll give you that. You looked at that. Great. You didn't look at something called SLF.

MR. HIRST: SLF is the final voting on an actuation.

MEMBER STETKAR: The SLF between the two dotted lines, not the SLF RDLC.

MR. HIRST: Correct. The voting, the two out of four voting is in the SLF.

MEMBER STETKAR: All right. You didn't look at spurious signals coming out of that if they -- if that is in a cabinet that then goes to several distributed locations where you have the local controls, you did not look at the effects of spurious signals coming out of the central SLF to all those distributed locations.

You looked at the distributed locations one by one, right?

MR. HIRST: Well, the SLF is only an actuation piece, okay. So, therefore, it's very limited on where it goes.

MEMBER STETKAR: Which SLF?

MR. HIRST: All of them. I mean, the SLF

is designated there where you do your two out of four voting. That drives the SLF RDLC.

MEMBER STETKAR: That SLF is probably a card, right?

MR. HIRST: No, it's an entire -- multiplex processors, yes.

MEMBER STETKAR: You have several of those mounted in the same cabinet.

MR. HIRST: They're actually in multiple cabinets in the electrical switchgear rooms.

MEMBER STETKAR: Okay. The analogy is if I have an old analog-driven plan that has Division A having all relays and copper things and it's all in Division A room and I burn up that Division A room deterministically now, I have to look at multiple spurious actuations coming out of that Division A room.

MR. HIRST: Right.

MEMBER STETKAR: Why don't I have to look at multiple spurious actuations coming out of the Division A room here that contains multiple SLF -- multiple cabinets that contain little digital SLF processors.

MR. HIRST: Now, if you're doing it strictly from a black and white situation that I can't take any -- I don't know what to say -- credit, any credit for the levels of redundancy and double-checking on this because it is a digital system, there's no digital faults coming out of SLF that would be any different than the fault I would have in the electrical room because that's a direct one-to-one relationship.

MEMBER STETKAR: And I guess I'm still not communicating effectively enough. Let me ask the question differently.

Do all of the SLFs that are listed shown on this drawing as two out of four, a single division, call it Division 1 --

MR. HIRST: Yes.

MEMBER STETKAR: -- go to local SLFs in a single room?

MR. HIRST: Yes.

MEMBER STETKAR: One and only one room in the plant.

MR. HIRST: There's one in the Reactor Building. I'm trying to think. Is that the only one?

(Comments off record.)

MR. HIRST: Oh, all right. And the remote shutdown room.

MEMBER STETKAR: So, there's more than one.

MR. HEACOCK: Yes. It will be isolated in the fire areas.

MR. HIRST: There are two set of fire areas.

MR. HEACOCK: Yes, it will be more than one. You can have multiple RDLCs.

MEMBER STETKAR: You can have multiple in different isolated compartments.

MR. HEACOCK: Fire areas.

MEMBER STETKAR: Fire areas.

MR. HEACOCK: Right.

MEMBER STETKAR: So, therefore, if I burn one of those isolated fire areas and affect all of the SLF RDLCs in that fire area, I will have potentially a different effect on the plant than if I burn what I'll call the central SLF which communicates now with several different fire areas.

Is that true, or am I misunderstanding something?

MR. HIRST: I don't see how it could be any different. Because the only thing coming out of the SLF, well, basically are open, close, stop, start. That's all it's telling the command to come out unless you're trying to say that a message turns all the stuff off or all the stuff on because of that message.

But you have the same issue with fire in a given room. Show the same thing. So, that's what I'm saying. There's no difference there.

(Comments off record.)

MEMBER STETKAR: What I'm saying is, and unfortunately I have to use visceral aids here, is this is what I'm calling the central SLF. The SLF two out of four.

MR. HIRST: Right. Right.

MEMBER STETKAR: And if that communicates to -- I'll keep it simple -- two SLF RDLCs that are located in different fire zones, each of which controls stops, starts, open, close different sets of equipment, then if I have a fire here in my blue one, I effect all of the equipment that comes out of the blue thing.

If I have a fire here in the white one, I affect all of the equipment that comes out of the white one.

If I have a fire here in the central one, I affect both blue and white. So, I can't say that I've assessed the effects of fires that affect the central thing simply because I've looked at the blue and I've separately looked at the white. That's what I'm trying to get at.

Now, if the blue and the white are all in the same fire zone, I can buy your argument. But if they're in separate -- two or more separate fire zones, I don't get it.

(Comments off record.)

MR. THOMAS: This is Steve Thomas. I just wanted to point out that the blue and the white are all divisional. So, you're looking at a piece of divisional equipment in the control room and divisional equipment in the plan.

For example, might be an RHR pump, valve and associated electrical equipment that supplies those components, but they're all divisional.

MEMBER STETKAR: See, I understand that. I actually understand that. What I don't see is the analysis that says suppose I burn up that division the worst way that I can burn up the division, and get the worst set of spurious signals out of that division, and I do that for each of the three divisions thinking about them carefully. Do I still have adequate remaining equipment to safely shut down the plant?

Now, the answer to that question may be yes, but I haven't seen anybody ask that question yet.

MR. HEACOCK: I think -- this is Evans. I think what we're trying to say is that, yes, the question has been asked and answered in high level 9.5.1.1.7 with the statement that is shown there.

And that's being -- part of that's going to be is that, yes, we understand there's a digital communication system and platform that sends out signals. They could be spurious signals.

We also have on the remote end and each one of the switchgear rooms where a lot of this actuation is going to take place, you have all your power and --

MEMBER STETKAR: A lot of it, but not -- if you say a lot of -- if it's not all, that's --

MR. HEACOCK: Hang on a second. Hang on a second. They go through to say that from a review from a spurious actuation, our really rebounding case is going to be what's in the larger area which control for these items going to be a Division 1 or Division 2 or Division 3 switchgear room which can control valves, control the pumps, all the pumps and all the valves in there for the plant itself since that's where you're going to send the signal to start and stop MCC contactors, 4160 switchgear breakers from that particular point.

As we said, one of the other locations not going to be in that same will be remote shutdown. You have an interface there. And you'll have some control for ADS. And they're not all valves, but you'll have some.

So, you don't have them all the same. But when you're looking at what your worst case is going to be, your worst case is going to be in that switchgear room from a spurious actuation that would really bound any kind of spurious signal that would be valid, should be a valid-type signal that could get through and cause spurious actuation somewhere else.

You have a lot more switchgear, a lot more equipment in that one area than what your computer system in a faulted, somewhat faulted state, not a truly faulted state, sending out erroneous signals that would cause multiple spurious actuations.

MR. HIRST: I mean, there's the act of communication. SLF RDLC. After RDLC, all -- there's actually two redundant sets of communication.

MEMBER STETKAR: Not always, as I understand it. Sometimes there's only one, but go on.

MR. HIRST: For the lower level functions.

MEMBER STETKAR: Yes.

MR. HIRST: For all your main functions that are significant events.

MR. THOMAS: There are always two redundant communication paths as shown. Sometimes there are two redundant SLFs.

MR. HIRST: Right. Yes. But there's always -- those are always redundant.

MR. THOMAS: Those two communication paths are --

MEMBER STETKAR: Sometimes it's too redundant.

MR. THOMAS: Yes.

MEMBER STETKAR: SLF RDLCs. One for a valve, one for a pump, et cetera.

MR. THOMAS: Exactly.

MR. HIRST: Once they've got to RDLC, they are individual chassis, individual processors that validate the signals. So, there's no way that you can -- wrong words?

MEMBER STETKAR: Right. That's the wrong word.

(Laughter.)

MR. HIRST: I don't see a valid method for a package, a message package coming out of different CPUs and different chassis going to different CPUs, different chassis all to the equivalent in order to cause a spurious action.

MR. HEAD: To be accepted.

MR. HIRST: To be accepted.

MR. HEAD: Accepted at the SLF RDLC as a valid signal. And both of them be identically --

MR. HIRST: Because the entire system was designed to eliminate spurious events whether fire in my RFI, surges, shorts, people unplugging things, you name it.

And that's what makes this system different. The base design from the beginning was dealing with avoiding spurious actuation in the equipment. And that's all final voted and verified at the SLF RDLC.

MR. HEAD: Which is one of the reasons I think the NEI guidance has not addressed the digital world because of this process that we've just talked about.

And that's why, you know, my staff and we've talked about and said, you know, 9.5.1.1.7 has language in it that is, you know, potentially controversial, but it is -- we stand behind it and it is what we think is the reason we believe the probability of this event coming from the control room is, whatever we want to call it, small.

MEMBER STETKAR: And, Scott, I'm not arguing with that statement. I believe that statement.

MR. HEAD: Okay.

MEMBER STETKAR: It's small if you were to do a probabilistic analysis. You're not, though. You have hung your hat --

MR. HEAD: We --

MEMBER STETKAR: -- on the fact that you're going to follow the deterministic guidelines for licensing the fire protection program on this plant.

MR. HEAD: Right.

MEMBER STETKAR: The deterministic guidelines don't say that you're allowed to say this is not very probable or it's very likely that this other thing will occur. They say you must assume that it occurs.

I think that's silly, but indeed that's the world that you have decided to adopt for your fire protection program.

MR. HEAD: So, we've decided to adopt what's on the diagram here. The NEI guidance will apply to the right side of the local where there's basically copper.

We don't believe the NEI guidance tells you what you should do or how you should do anything in the digital world.

MEMBER STETKAR: You're right. It doesn't. It's silent on it.

MR. HEAD: And we think it's silent for a reason. For the reason we've talked about. The creation of those signals, the absorption of those signals on the right side and redundant signals is small enough, the probability is small enough for the issues that are more real in the digital world than fire.

There are things that can happen in the digital side that are more significant, more global than a fire.

CHAIRMAN CORRADINI: I'm looking at you, John, because I can't ask any questions on this.

MEMBER STETKAR: Well, I don't have anything more to say. I think we're -- this is where we are.

MR. HEAD: I'll just offer that the last page of this presentation is what's, you know, there's two major points on there that the RDLC utilizes diagnostics -- we've alluded to that -- to verify the validity of each redundant message. And that's, I say, the messages have to be received and tested and verified that they are valid. And then there has to be two of them.

And while, you know, maybe that's a probabilistic argument. It almost looks deterministic to me. It's more deterministic than some of what --

CHAIRMAN CORRADINI: Can I say something back to you --

MR. HEAD: Sure.

CHAIRMAN CORRADINI: -- because I really don't really get a lot of this, but I've got my colleague here who wants to get it.

All right. If I go back to the picture, what you're basically saying is that in a deterministic way, it's impossible based on the design to have a spurious actuation.

MR. HEAD: No, we're saying essentially zero, but not zero.

CHAIRMAN CORRADINI: Okay. But -- okay. Fine.

MR. HEAD: Okay.

MEMBER STETKAR: And my point is in the analog world with relays and copper, the people say, well, it's essentially impossible to get a large number of spurious operations also. And, yet, deterministically you're required to assume that they will occur when you do deterministic fire analysis.

MR. HEAD: Not in the control room.

MEMBER STETKAR: In the control room, people typically say I can go to a remote shutdown facility and shut the plant down.

MR. HEAD: And that's what we're saying, too. That's what we're saying, too.

MEMBER STETKAR: However, I've seen designs where because of the way things are wired together or wired, for some sets of multiple spurious actuations you can't mitigate them from a remote shutdown facility.

All I'm trying to do is explore how carefully your fire assessment for every location in the plant, every compartment, control room being one of them, has looked at what can possibly happen and how well you're protected against it in a deterministic sense, because that's the world that you've established for your fire protection programs.

MR. HIRST: I almost look at it as our deterministic argument is the fact that every command we send down to the RDLC, you must get multiple commands.

Those commands must match exactly. And if they don't, it doesn't do anything. And to me, that's really our key issue.

MR. HEAD: That sounds deterministic to me. That's my --

MR. HIRST: Because we specifically and purposely put those multiple communications signals on separate controllers, separate cables and then compared them again so that we knew for sure deterministically that before we did anything else, it's got to match.

MEMBER STETKAR: And I get it. You know, it's five after 5:00. We can throw words back and forth at each other and it's just me speaking right now.

We have a subcommittee here of seven, eight people. Everybody has heard this exchange.

CHAIRMAN CORRADINI: We need the staff to come up and talk to us.

MEMBER STETKAR: We need the staff to come up and talk.

MR. HEAD: And thank you for letting us accommodate our schedule.

CHAIRMAN CORRADINI: Thank you. Okay. Staff is up. Scott, you're staying. We're losing your expert, but you're staying.

(Comments off record.)

CHAIRMAN CORRADINI: Okay. Dennis, is it you?

MR. ANDRUKAT: Yes, sir.

CHAIRMAN CORRADINI: Okay. Have at it.

MR. ANDRUKAT: Well, not quite.

(Comments off record.)

MR. BETANCOURT: Okay. So, let's go to the handout since we don't have the presentation review in front of us. Good afternoon. Thank you for having us here today.

My name is Luis Betancourt. I am the PM with the STP COLA. Today I have over here also with me Dennis Andrukat, the fire protection engineer for this action item.

Today we are going to be discussing how the staff is addressing this action item, fire-induced multiple spurious actuations in a digital cabinet.

This action item came up out of the Chapter 9 presentation of the STP COLA back in October 2010. The members asked us to work together with NRC fire, as well as NINA on this topic.

So, you look on the second slide. This is the staff review as well as Dennis Andrukat's assessments on the fire protection. I will now turn it over to Dennis and Slide Number 3.

MR. ANDRUKAT: Okay. So, the background, as we know, four years ago, Dr. Stetkar, you brought up this question about the adverse effects due to a fire.

MEMBER STETKAR: That was four years ago?

MR. ANDRUKAT: Yes. The staff still maintains that there's reasonable assurance that a fire will not prevent the ability to achieve and maintain safe shutdown even given the digital question.

If we move to Slide 4, I believe we talked about this a little bit with NINA's presentation. The hard wire portion of this is going to follow NEI 00-01. And also is going to follow Revision 2 of Reg Guide 1.189, which is the fire protection for nuclear power plants guidance document for those portions that relate to spurious operation.

Moving forward to the I&C architecture portion, in addition to the presentation that NINA has given, the staff finds it reasonable given the architecture, given the robust features such as diversity, redundancy, reliability and some additional layers of protection, we still find it reasonable that you're still going to have one train of safe shutdown equipment to achieve and maintain safe shutdown.

CHAIRMAN CORRADINI: So, can I ask a question --

MR. ANDRUKAT: Yes.

CHAIRMAN CORRADINI: -- since I think you're done.

MR. ANDRUKAT: Yes. I mean, I have some layers in page Number 5.

CHAIRMAN CORRADINI: Right. But what I'm hearing you say since I've heard Mr. Stetkar a lot, what

I'm hearing you say is you accept their probabilistic/deterministic argument.

MR. ANDRUKAT: We don't accept it as a probabilistic --

CHAIRMAN CORRADINI: Well, you can define it however you want, but what I'm hearing in simple vernacular is they're saying it's so low as to not be possible. And you're saying, yeah.

MR. ANDRUKAT: In addition -- well, by itself I don't think we can say that.

CHAIRMAN CORRADINI: So --

MR. ANDRUKAT: So, we have these additional layers of protection. We also sit there and say, if I can throw out some scenarios that we were talking about with the RDLCs, for example, the RDLCs are separated by division in the switchgear room. The input to that is digital. The output is hard wires.

The NEI guidance -- and that's the entire division in one fire area. And then you have one fire area per division.

That NEI guidance will account for spurious actuations for each of those components. I don't know if that makes sense.

CHAIRMAN CORRADINI: Yes. Go on.

MR. ANDRUKAT: Okay. So, at least in the

switchgear room we're accounting for that's one division and it will not affect other divisions.

So, we still have two other divisions at this point that are free from fire damage that can achieve and maintain their ability to safely shut down.

If we backup to the control room where the DTFs and the SLFs are, you can have what we were thinking of. Two basic scenarios.

One, how they describe in basic terms in the DCD and FSAR if you have a fire or smoke, they're going to consider -- we're going to render the entire room, the entire fire area -- the entire fire area is the main control room and the two computer rooms, if you will.

Okay. They're going to render that inoperable, unhabitable. They're going to transfer and run to the remote shutdown station.

MEMBER STETKAR: Sure.

MR. ANDRUKAT: Okay. In that case, you have isolated the issue as far as we're concerned. The other --

MEMBER STETKAR: You've isolated the issue after you got there. The problem is the issue may have done things to you in the interim before you got there and isolated it. So, valves could have been repositioned.

MR. ANDRUKAT: Correct.

MEMBER STETKAR: And valves that you cannot control from a remote shutdown room, because you only have a limited amount of controls there.

MR. ANDRUKAT: You have a limited amount of controls. You have the -- correct. You do have up front, you have the necessary controls at each remote shutdown station if you didn't have an event, correct. Right.

MEMBER STETKAR: That's right.

MR. ANDRUKAT: But you still have the ability to -- so, you're bringing a timing thing into this, if you will.

If you're going to have a digital failure before you're transferring the switch, before you're isolating the control room --

MEMBER STETKAR: Now, I had a fire. Remember this is --

MR. ANDRUKAT: You had a fire-induced --

MEMBER STETKAR: I had a fire.

MR. ANDRUKAT: A fire-induced spurious signal. Multiple spurious signals before you transferred.

Within a division, I believe we're still covered. You still have an analysis on a single division, an entire division from RDLCs that's covered by the methodology. If you spuriously actuate those components, you have analysis.

MEMBER STETKAR: Provided -- and, again, I'll bring you back to this notion of spatial distribution. Provided that all of those RDLCs live in the same space.

MR. ANDRUKAT: Correct.

MEMBER STETKAR: If they live --

MR. ANDRUKAT: And that's our understanding.

MEMBER STETKAR: -- in different spaces, then I get back to my white and blue and central, you know, visual aids here.

MR. ANDRUKAT: And our understanding is they are all in the switchgear room.

MEMBER STETKAR: That's good news.

MR. ANDRUKAT: Within the control room, you know, you still have the three separate divisions per cabinet. They're not mixing -- and STP can correct me if I'm wrong -- they're not mixing divisions within cabinets.

MEMBER STETKAR: Right.

MR. ANDRUKAT: If you're in a situation that you're not abandoning the control room, you know, now you're kind of in what-if space. But this is where I think the reasonable assurance of, I'll say, coping strategies where we have trained operators, we have procedures inside the control room that will try to find the source, try to put out the fire, whatever they have to do to mitigate that situation without -- before they can abandon the control room, you know.

I don't know if it's reasonable or not to sit there and say that that would spread past more than a cabinet or more than a division.

MEMBER STETKAR: The deterministic stuff just says you burn up everything --

MR. ANDRUKAT: But if you're in a deterministic space --

MEMBER BLEY: That's true for Appendix R kind of stuff, deterministic fire, but it's not true for other deterministic aspects of regulation.

We've always had in the deterministic side, this idea of beyond reasonable not being there. We don't look at spurious, I mean, a sudden reactor vessel failure all by itself. We don't look at concurrent Chapter 15 events happening at the same time.

So, there's a range of things for which

there's been a reasonable -- it's never been completely defined, but it's pretty remote.

I'm not sure where that fits with --

MEMBER STETKAR: I'm not sure either, because -- I'm just not sure. I'm not sure.

MR. ANDRUKAT: And usually for control rooms, though, I mean, you're relying on remote -- an independent -- something that's electrically and physically separated, hence the remote shutdown panel, and a transfer switch.

In our guidance documents, that's what we rely on for the control room, you know, which is a little bit, you know, control room analyses are quite different than the fire hazard fire safety shutdown analysis you would do for any other fire area. And there's some leniencies similar to containment. You have some leniencies based on you can't separate all four divisions in those two areas. So, there's a different strategy.

MEMBER STETKAR: Dennis, let me see if, you know, badgering people, are the -- I think I've established at least from your perspective that the RDLCs, at least your understanding is that they are located in three, and only three, switchgear rooms in the plant. In other words, they're not distributed throughout the Reactor Building, for example, in, you know, six or eight or 10 different locations.

MR. ANDRUKAT: Correct.

MEMBER STETKAR: Okay.

MR. ANDRUKAT: At least -- and STP can step in. And I also want to add we're not necessarily preventing all spurious actuations. We are only concerned with the spurious actuations that prevent the ability to achieve and maintain safe shutdown.

MEMBER STETKAR: True.

MR. ANDRUKAT: If you have an RDLC that's somewhere else, that spurious actuation just makes a mess somewhere else, but doesn't affect a Fire 3 Division from achieving, say, you know --

MEMBER STETKAR: Let me give you an example only because this is something that pops into mind for pressurized water reactors.

I've looked at plants where spurious signals in non-safety-related systems throw the plant into a trajectory not necessarily preventing safe shutdown, because it's a very, very plant-specific analysis, but throw it into a trajectory that you would not necessarily think about only looking at your safety-related divisionalized stuff.

MR. ANDRUKAT: Correct.

MEMBER STETKAR: And some of those trajectories we've actually found are not well-protected because of the presumptions about -- especially in a plant like this where you have fours and threes, you know, it's not a perfectly symmetric --

MR. ANDRUKAT: Correct.

MEMBER STETKAR: -- four-train plant or two-train plant.

MR. ANDRUKAT: Right.

MEMBER STETKAR: We found cases where some of those trajectories wind up in very funny situations. They're rare, but they're not zero. And why I'm trying to pursue this is to see how carefully anyone has thought about that.

MR. ANDRUKAT: Okay.

MEMBER STETKAR: Now, the other thing is do we know that all of the SLFs on this drawing here are located in the control room, or are they located in other rooms that are outside of the control room, but what might be defined from the purposes of ventilation or other reasons, called the control room envelope.

CHAIRMAN CORRADINI: We're asking STP this, right?

MEMBER STETKAR: Yes. Are they actually in the control room where the operators live?

MR. HIRST: They are part of the control room fire zone. There are two relay rooms.

MEMBER STETKAR: That's what I was looking for.

MR. HIRST: Yes, but they are all there in one place.

MEMBER STETKAR: Well, no. Are they -- if I'm sitting here, I'm an operator and I have these nice little terminals and this is where I live and it's a room. It's got walls. It's got floors.

MR. HIRST: Uh-huh.

MEMBER STETKAR: Are the cabinets that contain those processors within this space, or are they in another room?

MR. HIRST: They're in two rooms. One in the front, and one in the back of the physical boards.

MEMBER STETKAR: But they're separate rooms.

MR. HIRST: Yes.

MEMBER STETKAR: Okay. Do they communicate with the space where I live?

MR. HIRST: Yes.

MEMBER STETKAR: How do they communicate?

MR. HIRST: It's -- well, cable and HVAC, because it's a false floor of the whole area.

MEMBER STETKAR: But it communicates through the false floor.

MR. HIRST: Yes.

MEMBER STETKAR: Okay.

MEMBER RYAN: So, you have one room.

MEMBER STETKAR: No, not necessarily.

MR. HIRST: One fire zone.

MEMBER STETKAR: But that's my whole point. Fire zones are defined for fire protection, for ventilation, for safety-related isolation. Fires don't necessarily -- it's when you get into defining compartments for fire analysis.

Fires -- a single fire zone might involve multiple compartments, or a single compartment might involve multiple fire zones, because fire zones are defined for different purposes.

MR. ANDRUKAT: Zones don't necessarily mean walls, for example.

MEMBER STETKAR: Right.

MR. ANDRUKAT: Or fire barriers.

MEMBER STETKAR: So --

MR. ANDRUKAT: Fire areas will tell you fire-rated barriers.

MEMBER STETKAR: So, when you make -- the reason I was trying to get a little more precise is if indeed the cabinets were located within the same confines of where I live, it's a little different situation. That is the traditional control room fire analysis.

MR. HIRST: They are essentially in the area where the operator lives. And each one of the cabinets has got a temperature monitoring. Now, as soon as it feels heat, you're going to get alarms.

Now, at that point, the operator is going to open the door and say, what's going on here? It's when the cabinet gets hot.

MEMBER STETKAR: Are there -- since I have three divisions, these other rooms, are there six of them? Are there three of them? There are two of them; am I correct?

MR. HIRST: There are two relay rooms.

MEMBER STETKAR: Relay rooms. Two relay, but I have three divisions of things and four sets of input signals.

MR. HIRST: So, four divisions and call it three trains.

MEMBER STETKAR: Four divisions, three trains, okay. We'll use that terminology.

MR. HIRST: And two of them, they're split between the two rooms. Two in one. That's the way the --

PARTICIPANT: Two in one area on one side of the control.

MR. HIRST: East side and west side in our plant.

MR. HEACOCK: The way the divisions are separated they have the control room in the center, two on one side, two on the other.

MEMBER STETKAR: Those are divisions. What about my trains, though?

MR. HEACOCK: Well, the trains are in a different area altogether. So, the way the signals are carried --

MR. HIRST: Okay. Wait a minute. As far as the SLFs go, the (coughing) train level SLFs are associated with Division 1, Division 2 and Division 3.

MR. HEACOCK: Right.

MR. HIRST: So, therefore, they're in that equipment area in their own cabinet. Now, once they leave the control room, they go to separate chassis all going to the electrical trains.

MEMBER STETKAR: Let's see if I can bring you back to the picture that we're looking at here so that I can try to understand this.

I'm focusing on the thing -- right there. Thank you. I'm focusing on the thing that's called SLF 2/4 typical of three divisions. Where are the cabinets for those things?

MR. HEACOCK: Those are in the control room.

MEMBER STETKAR: Physically where?

MR. HEACOCK: Where he was pointing to.

MEMBER STETKAR: And when I say "control room," I mean physically where I come to work and sit down at my terminal every day in that -- in the confines of that enclosure.

MR. HEACOCK: No.

MEMBER STETKAR: No. So, I'm hearing yes and no.

MR. HEACOCK: The division -- these are the SLFs for the divisions where they'll communicate where they'll send the signals out. Those are on the other side of the control room in separate, little areas, but still part of --

MR. HIRST: Part of the control room. We consider that part -- that's the control room envelope.

(Comments off record.)

MR. HIRST: These four divisions here and we have three of each ~~eight~~. Okay. These are in either end of the control room envelope in that east and west area.

MEMBER STETKAR: Now, let's go on now the analogy that we are all sitting in the control room because we all have terminals here. And out that door, because that happens to be an open door, could the cabinets be in that annex room out that door?

MR. HIRST: Yes.

MEMBER STETKAR: Yes, okay.

MR. HIRST: They are.

MEMBER STETKAR: They are. A different compartment.

MR. HIRST: Yes.

MEMBER STETKAR: A different room. Now, how many of those rooms are there? Two?

MR. HIRST: There's two.

MEMBER STETKAR: Two. One of those rooms contains two of those three divisions? No, I'm sorry. There's only three of these things. There's four of those.

MR. HIRST: One has got one, and the other one has got two.

MEMBER STETKAR: Good. Thank you.

MR. HIRST: Uh-huh.

MEMBER STETKAR: So that if I have a fire in one room, I have a different effect than if I have a fire in the other room, because one room can affect two of the three divisions, and one can affect one of the three divisions.

MR. ANDRUKAT: Correct.

MEMBER STETKAR: Okay. Thank you.

CHAIRMAN CORRADINI: Are you done?

MEMBER STETKAR: I'm done.

CHAIRMAN CORRADINI: I don't mean to seem uneducated, but now that we're done I'm not sure where that leads us.

Because what I'm hearing from the staff is, and I just want to paraphrase so I don't come off base, is the staff feels confident with the design that deterministically, I'll use their terminology, there is enough redundancy and backup that they don't see spurious signals propagating to the area where we have -- I thought.

Say it again, because that's what I read in your four slides.

MR. ANDRUKAT: So, not speaking to the redundancy, there's still reasonable assurance you have divisional separation.

We have divisional separation outside the control room. We just talked about a little bit of divisional separation within the control room. The control room is analyzed a little bit differently.

In addition, there is electrical -- not just physical separation, electrical separation, because again the bottom line is I just need one division.

MEMBER STETKAR: Dennis, I'll come back and we need to stop this because it's 5:30 and we have other things to do, but I'll now get a little more specific because I understand the spatial configuration a little better.

So, I'll come back to my previous discussion about the fact that one of those rooms outside the door contains two of the three divisions. The other room contains one of the three divisions.

MR. ANDRUKAT: Correct.

MEMBER STETKAR: Good? If I have a fire in the room that contains the two divisions, do I have assurance that given the worst combination of multiple spurious operations from those two divisions, I can still safely shut down the plant with the remaining division.

MR. ANDRUKAT: Yes.

MEMBER STETKAR: And looking at all combinations, you know, the multiple spurious signals.

MR. ANDRUKAT: To my knowledge, yes.

MEMBER STETKAR: Okay.

CHAIRMAN CORRADINI: Are there questions from the other members of the Committee?

(No response.)

CHAIRMAN CORRADINI: Okay. So, Scott, now that you've hung on, can you join or come up front? I want to make sure we go around, because this is our last -- I'm sorry. Excuse me. We have other open items. Excuse me. I apologize. I forgot.

MR. HEAD: I think I'm closing all of those.

CHAIRMAN CORRADINI: So, Luis.

MR. BETANCOURT: So, I guess we can actually touch upon that separately, or I can actually go through it very quickly. It's up to you.

CHAIRMAN CORRADINI: I would prefer you touch on it now.

MR. BETANCOURT: Okay. So, as part of the discussion, one of the members asked us regarding the STP design and there was the transformer.

MEMBER STETKAR: So, as far as -- and we had a really good presentation in the last subcommittee meeting --

MR. BETANCOURT: Correct.

MEMBER STETKAR: -- about the philosophy. So, I, you know, I personally am fine with the issue of open phase.

MR. BETANCOURT: We just wanted to.

MEMBER STETKAR: And that's fine.

MR. BETANCOURT: With that, that concludes my presentation.

CHAIRMAN CORRADINI: Okay. That's it?

MR. BETANCOURT: That's it.

(Comments off record.)

CHAIRMAN CORRADINI: We're going to be fairly flexible, Scott.

MR. HEAD: Okay. One last item was regarding the CEUS issues. And there was questions regarding our analysis.

CHAIRMAN CORRADINI: And we had a memorandum from the Committee about your discussion point.

MR. HEAD: Right. And I believe the discussions you heard from the industry basically has subsumed our issue. And I believe -- I was hoping that we'd get on the record that that issue is closed with respect to STP.

MEMBER STETKAR: Yes. And as far as since I raised the question again, as far as I'm personally concerned, you've done -- you followed the industry guidance.

MR. HEAD: Yes, sir.

MEMBER STETKAR: So, any questions that we have that are with the industry guidance. It's a generic.

MR. HEAD: The last meeting we had regarding spent fuel racks, you had asked -- Member Stetkar asked a question about the fuel, top of active fuel versus the gate elevation.

MEMBER STETKAR: Yes.

MR. HEAD: And Steve Thomas said it's four feet. And we committed to go back and look at that. And we went back and looked and it's in fact 32 inches above the top of active fuel, and 10 inches above the top of the rack.

So, the issue is covered, but it was not --

MEMBER STETKAR: That's just clarification for the record.

MR. HEAD: And I guess I want to correct or at least -- I'm sorry.

CHAIRMAN CORRADINI: No, you have the floor. I'm not going to stop you. You're doing well.

MR. HEAD: Regarding, you know, regarding the SLF RDLCs, okay, we have not --

(Laughter.)

MR. HEAD: So, we have not designed the plant. And so, for us to assert that they're all in the same place is possibly premature, okay, but very likely, but still premature.

My point would be still is that's irrelevant.

MEMBER STETKAR: Well, okay. On the flipside, you haven't designed the plant yet. And quite honestly, some of the reasons that I'm emphasizing this is that when you finally get to design the plant, meaning the layout, spatial layout of stuff in the plant, it could be very useful for you to think about the types of things I'm trying to emphasize. Because I have seen examples of people with all good intentions designing backfits on -- "backfit" is a bad term -- modifications to plants where they haven't thought carefully about those spatial separation things.

They've thought very carefully about piping, electrical -- separation, electrical isolation, but done things like put things in the same cabinet so they didn't benefit, for example, from the effects of fires or routed cables through the same area where they were particularly sensitive to fires for cables.

So, part of this at an early phase thinking about, well, I've got two divisions out in that room, have I carefully thought about how those can affect me, or maybe when I finally build the plant, do I want to segregate those with a wall between them, now is the time to kind of ask those questions before you actually design the plant and say, oh, gee, maybe I would have done it differently had I thought about it.

MR. HEAD: And see, I think we're -- if we were in an analog world, we might accept that premise. Okay. In the digital world and the diagnostics that are involved in these signals, we really don't accept that premise that that is an issue because we believe --

MEMBER STETKAR: I hear you.

MR. HEAD: And if we don't accept it, I think as I go back, I think that's why the NEI guidance has not been involved to that period of time is because it is -- it does represent a step forward from the analog world that would have been next door from an older plant or in the room next door in my older plant.

So, Mr. Chair, what I really was trying to say is I would hate -- I'd hate to say that the definitive statements about the plant design are known, okay.

CHAIRMAN CORRADINI: They're too premature to be known.

MR. HEAD: They're just too -- we know where the remote shutdown panel is, we know where each division is, but for us to absolutely cert that right now before is not true -- or is not known at this point.

CHAIRMAN CORRADINI: Okay.

MR. HEAD: So, I don't want that on the record that we know all that.

CHAIRMAN CORRADINI: That's fine. Okay. So, we've completed 64, Mr. Head.

MR. HEAD: I'm sorry. I was going to go back to the -- we had a couple of things we wanted to correct from the Fukushima discussion, but I don't know where we are because I don't think the staff is finished with their Fukushima discussion.

CHAIRMAN CORRADINI: No, I thought they were.

MR. HEAD: Okay. Sorry. There was a question about ACIWA feeding both units, which it can. But if RCIC were to fail immediately, then feeding both units would not be --

MEMBER STETKAR: You cannot feed both units form T zero.

MR. HEAD: Right. With the one pump. But

what we would do is get one of the other pumps and hook it up to the fire water.

MEMBER STETKAR: They have a couple hundred gpm capacity? Are they 500, I mean basically diesel-driven.

MR. HEAD: Right. I think they are -- the fire pump -- the fire truck is equivalent to ACIWA, I believe.

MEMBER STETKAR: Is it?

MR. HEAD: Yes.

MEMBER STETKAR: You can buy fire trucks with sort of distinct capacities.

MR. HEAD: ACIWA is actually 900 if --

MEMBER STETKAR: ACIWA is 900 if you get it down to, you know, let's run out.

MR. HEAD: I think we answered the question globally, but the one would only feed -- only have enough flow for one unit. That was our correction we wanted to offer. At least a verification.

CHAIRMAN CORRADINI: Okay. Anything else?

(No response.)

CHAIRMAN CORRADINI: Okay. So, at this point, nobody go anywhere. What I'd like to do is open the phone lines and ask if there is anybody on the phone lines.

Would you, Quynn, do that? We'll have public comments. And as we're waiting for that --

MR. NGUYEN: Phone line is open.

CHAIRMAN CORRADINI: Phone line is open. Is anybody on the line? Make a noise.

(Pause.)

CHAIRMAN CORRADINI: We'll close the phone lines. Is there anybody in the audience that wants to make a comment?

(No response.)

CHAIRMAN CORRADINI: Okay. So, now we're at the point where we'll go around. And we'll start with Pete.

MEMBER RICCARDELLA: No comments.

CHAIRMAN CORRADINI: But let me broaden it and let me -- the broaden it goes like this is that this is our last scheduled subcommittee meeting. So, it's not simply these topics. It's these topics and anything else that precedes it, because we're planning to write a letter on STP COL in February. Thank you very much. In February.

MEMBER RICCARDELLA: I still have no comments.

CHAIRMAN CORRADINI: Okay. Fine. Dana.

MEMBER POWERS: I anxiously look forward to this.

CHAIRMAN CORRADINI: I'm glad somebody is anxious.

(Laughter.)

MEMBER POWERS: Well, I think it will be an EPR letter.

CHAIRMAN CORRADINI: Okay.

MEMBER POWERS: No pressure, Mike.

(Laughter.)

(Comments off record.)

MEMBER POWERS: I said a template. It's not going to be possible to copy STP and EPR.

CHAIRMAN CORRADINI: Okay.

MEMBER BLEY: Nothing more.

MEMBER STETKAR: Nothing more from me.

CHAIRMAN CORRADINI: Thank you.

(Laughter.)

CHAIRMAN CORRADINI: I'm thanking you.

MEMBER STETKAR: You're welcome.

MEMBER RYAN: All set. Thanks.

MEMBER REMPE: No comments.

CHAIRMAN CORRADINI: All right. Okay. So, let me at least for the Committee and you guys are here, so you can hear it, my plan really is in terms of drafting something that we have -- we've done draft now -- I guess it's been five years. A wonderful five years in this.

So, what I'm planning to do at least for the letter is try to focus on Fukushima actions and the particulars about the site relative to site-related activities.

There are two or three issues. Charlie is not here now. There is two or three issues in terms of the turbine overspeed, the mono-block, some of these things that probably at least in my mind they are not issues, but I'm going to send a note out to the -- we have a draft note. I'm sending it out to the Committee just so that they're clear about those, but we'll probably focus on the site issues and the Fukushima-related activities for the letter.

Because I think -- personally I think it's a reasonably good design at a reasonably good site, but that's just me.

MEMBER POWERS: I have to say that I really appreciate it and the rationale you did, because this is the one that poses the biggest hassle for the people on the site doing anything about it.

I think that's something that needs to be done, rather than continuously escalating the probability of more and more intense ground motions.

What is the accident that poses the biggest challenge and the people coping with it? People and equipment coping with it.

I appreciated your rationale there and I think it would be useful to articulate that rationale before the full committee.

CHAIRMAN CORRADINI: So, no pressure. But I think from the standpoint of presentation to the full committee assuming the Committee members are okay with the idea about how we'd approach it, I think focusing on the site, focusing on things related to site events such as the MCR, okay.

And then the Fukushima-related issues and how you dealt with them would be the appropriate thing to talk about in front of the full committee, unless the members feel differently. Okay.

MR. HEAD: And any of the stuff that we had covered before the previous letter --

CHAIRMAN CORRADINI: I don't think -- personally, I don't think it rises to the need to --

MR. HEAD: Okay.

CHAIRMAN CORRADINI: -- bring it up.

MR. HEAD; All right.

CHAIRMAN CORRADINI: But again, I just one of 13. Just one of the baker's dozen.

MR. HEAD : AS I recall, we have one hour or two normally for that?

CHAIRMAN CORRADINI: Well, that's negotiable with the leadership.

MR. HEAD: That's true.

CHAIRMAN CORRADINI: I mean, probably an hour and a half. Probably a couple hours.

MEMBER POWERS: Do not presume that members who have not attended the Subcommittee meeting have a good memory of what your site is.

CHAIRMAN CORRADINI: Don't presume any of the members have any memory. But I do think, though, you want to focus on these sorts of issues.

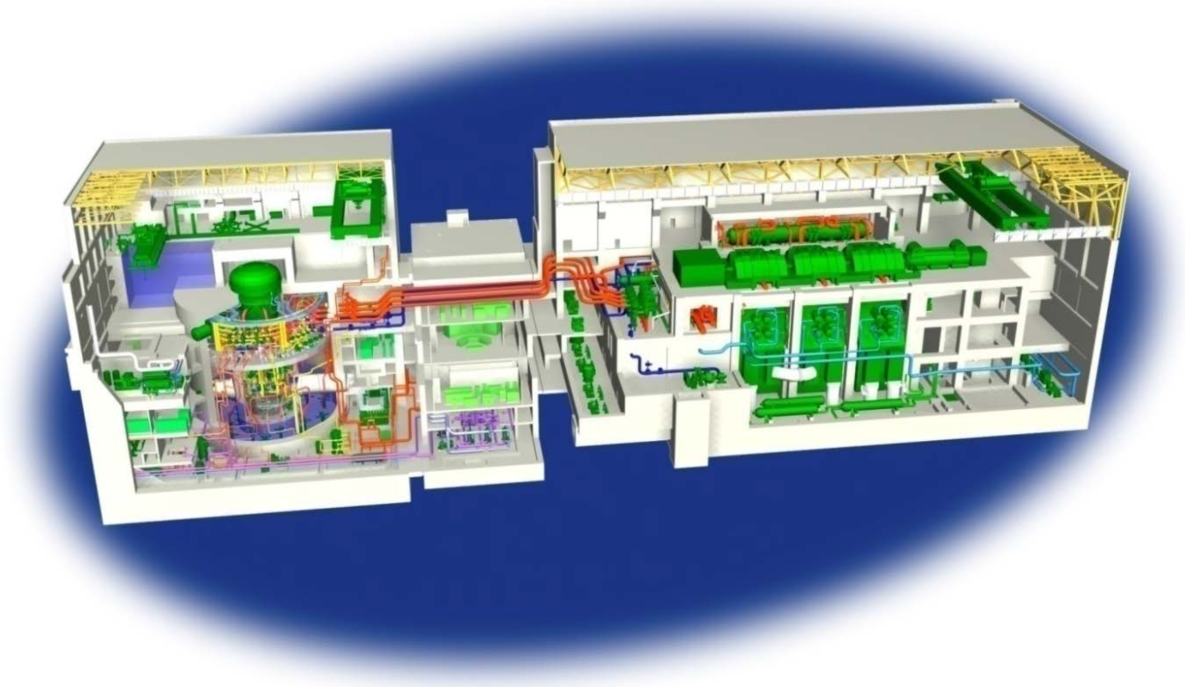
All right. With that, we're adjourned.

(Whereupon, at 5:44 o'clock p.m. the meeting was adjourned.)

South Texas Project Units 3 & 4

Mitigating Strategies for Beyond Design Basis External Events

(Recommendation 4.2)



Attendees

- Scott Head, Regulatory Affairs Manager, NINA
- Steve Thomas, Engineering Manager, NINA
- Bill Mookhoek, Licensing Supervisor, NINA
- Jim Tomkins, Licensing, NINA
- Richard Scheide, Licensing, NINA
- Evans Heacock, Electrical Engineering, NINA

Agenda

- Regulatory Framework
- DCD Features that Mitigate a Station Blackout
- Enhancements to Address NRC Fukushima Recommendations
- FLEX Plan Sequence of Events
- Supporting Analyses
- Summary
- Conclusions

Regulatory Framework

- SECY-12-0025 identified actions in response to Fukushima event
- Four actions apply to new reactors
  - 2.1 – Seismic and Flooding Re-evaluations
  - 4.2 – Mitigating Strategies for Beyond Design Basis Events
  - 7.1 – Spent Fuel Pool Instrumentation
  - 9.3 – Enhanced Emergency Plan Staffing and Communication
- STP 3&4 response to these actions is in FSAR Appendix 1E
- Previously discussed 2.1, 7.1, and 9.3 with ACRS
- Presentation today will cover 4.2

DCD Features that Mitigate a Station Blackout (SBO)

- Combustion Turbine Generator (CTG)
- AC-Independent Water Addition (ACIWA)
- Reactor Core Isolation Cooling (RCIC)
- Containment Overpressure Protection (COPS)
- Substantial Battery Capability

STP 3&4 ABWR Enhancements

- CTGs qualified for design basis hurricane and tornado missiles (already flood protected)
- ACIWA system and fuel tank qualified for site flood and severe weather events (already seismically qualified)
- ACIWA Fire Water Storage Tanks (FWSTs) qualified for site-specific seismic, missile, flood, high wind and other site severe weather events
- ACIWA able to use Ultimate Heat Sink (UHS) water inventory

STP 3&4 ABWR Enhancements *(continued)*

- Alternate Spent Fuel Pool (SFP) Makeup and Sprays
- Substantial onsite diesel fuel oil and water supplies
  - Over 1,700,000 gallons of diesel fuel oil
  - Over 35,000,000 gallons of water

STP 3&4 Enhancements *(continued)*

- Condensate Storage Tank (CST) designed for site-specific seismic, missile, flood, high wind and other site-specific severe weather hazards
- Battery connections installed and cables staged to allow cross-connection between the divisions
- One plant stack radiation monitor powered by Class 1E power

STP 3&4 Enhancements *(continued)*

- Permanent connections to allow the Phase III 480V 1500 kW diesels to be connected from outside the Reactor Building to supply Engineered Safety Feature (ESF) loads
- Internal plant radio communications powered by non-Class 1E batteries for 36 hours. These batteries are seismically mounted in the Control Building.

Combustion Turbine Generator

- One 20 MW CTG for each unit
- Diverse and independent from the Standby Emergency Diesel Generators (EDGs)
- Capable of supplying all three Class 1E busses
- Cross-connects to the other unit
- Seismically robust
- Protected from design basis hurricane, tornado missiles, and flood

AC-Independent Water Addition

- Diesel powered system
  - Installed diesel powered fire pump (common)
  - Fire truck (one per unit)
  - Trailer mounted portable pump (one per unit)
- Injects via Residual Heat Removal (RHR) piping to provide:
  - Core cooling
  - Drywell and Wetwell Spray
  - Spent Fuel Pool (SFP) Makeup

AC-Independent Water Addition *(continued)*

- Sufficient flow rate for both units and both SFPs
- Dedicated onsite water storage of > 600,000 gallons
- Diesel fuel tank supports 36 hours of operation
- Protected from site-specific seismic, missiles, floods, high wind and other site-specific weather

Reactor Core Isolation Cooling

- Advanced steam-driven turbine/pump system
  - Mono-block, totally self-lubricated design
- Supplies water to the core over the full spectrum of Reactor Pressure Vessel (RPV) pressures
- Suction from Suppression Pool (S/P) or CST
  - CST has capacity of > 500,000 gallons (250,000 gallons credited)
- RCIC is part of Emergency Core Cooling System (ECCS) and is protected from all design basis external events

Containment Overpressure Protection System

- Hardened passive vent system
- Rupture disk actuates at 90 psig
- Ensures containment structural integrity and provides containment cooling
- COPS components located inside the Reactor Building

Substantial Battery Capability

- Four (4) Divisions of Class 1E batteries
- Class 1E batteries capable of more than 12,000 amp-hours
- Non-Class 1E 250V battery capable of more than 8,000 amp-hours
- Shedding of non-essential loads can extend Division I battery life to more than 40 hours

Alternate Spent Fuel Pool Makeup

- ACIWA is the preferred method of makeup to SFP via RHR piping
- Two external standpipes that can provide makeup and spray to the SFP were added to design as part of Mitigative Strategies for the Loss of Large Area of the Facility Effort

Summary of STP 3&4 Key Features

- ABWR was designed for an SBO with or without the CTG
- CTGs would be expected to provide power to mitigate this event using ECCS systems
- Additional enhancements to the design have been made for STP 3&4
- Even without crediting the CTGs; ACIWA, RCIC, and COPS can mitigate the extended loss of AC power

STP 3&4 FLEX Plan

- Based on industry guidance in NEI 12-06
  - Phase I – Installed equipment
  - Phase II – Portable equipment
  - Phase III – Offsite equipment
- STP 3&4 Phase I is 36 hours in length
- Phase III directly follows Phase I (no Phase II required)
- Offsite equipment arrives at the staging area within 24 hours of request, ready for use at 32 hours
- Beyond design basis limiting external event is a flood caused by a breach of the Main Cooling Reservoir

STP 3&4 FLEX Plan – Sequence of Events

- Extended Loss of AC Power (ELAP) and Loss of Normal Access to the Ultimate Heat Sink occurs at t = 0
  - All 6 offsite power connections, all 6 EDGs, and 2 CTGs not available
- Operators declare ELAP in 30 minutes
- Command and control relocated to Remote Shutdown System (RSS) room in 1 hour
- Perform load shed within 1 hour to extend Division I battery life to > 40 hours
  - Computer system is most significant battery load
- RCIC provides initial core cooling with suction from CST

STP 3&4 FLEX Plan – Sequence of Events *(continued)*

- RCIC suction switches to S/P due to Hi S/P level within a few minutes
- RCIC operated manually after load shed
- Request for offsite supplies at ~ 2 hours
- As S/P approaches 250 degrees F, RCIC suction switched to CST at ~ 10 hours
- COPS expected to actuate at ~ 20 hours
- Design Basis Flood has dissipated at ~ 20 hours
- Offsite equipment arrives at offsite staging area at 26 hours
- Offsite equipment in place and operational at 32 hours

STP 3&4 FLEX Plan – Sequence of Events *(continued)*

- Phase III starts in 36 hours
- When CST nears depletion (> 36 hours), core cooling transitioned to ACIWA
  - RPV depressurized using Safety Relief Valves (SRVs)
  - RCIC secured
- Ventilation restored in smoke purge mode
- Batteries being charged at 36 hours
- Command and control returned to Main Control Room
- ACIWA makeup to SFP initiated

STP 3&4 FLEX Plan – Sequence of Events *(continued)*

Long Term Actions:

- Restore normal AC service via EDGs or CTGs
- Restore DC loads
- Replenish ACIWA fuel oil supplies
- Connect UHS water supply to ACIWA
- Fill SFP as needed
- Restore normal core cooling functions
- Re-establish normal ventilation and cooling
- Restore AC service via offsite power

STP 3&4 FLEX Plan – Sequence of Events *(continued)*

Time critical steps :

- Declare ELAP in 30 minutes
- Relocate command and control to RSS room in 1 hour
- Perform load shed within 1 hour

Supporting Analyses

- Core and containment thermal-hydraulic analysis performed using MAAP Version 4.0.7
- Simulator scenarios performed to validate event timing and plan feasibility
- Electrical calculation performed to validate battery capability
- SFP heat-up calculations performed to determine when SFP replenishment is needed
- These analyses collectively demonstrate the FLEX Plan is viable:
    - Core, containment, and spent fuel cooling requirements met

ABWR Simulator

STP 3&4 FLEX Plan – Summary

Key safety functions maintained:

- Core Cooling
  - RCIC (0-36 hours)
  - ACIWA (beyond 36 hours)
- Containment Cooling via COPS
- Spent Fuel Cooling
  - No makeup needed for more than 36 hours
  - ACIWA
- Defense-in-depth

Conclusions

STP 3&4 ABWR has robust capability to mitigate a beyond design basis external event

- Plant is self-sufficient for more than 36 hours
- Core, containment, and spent fuel cooling maintained

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Presentation to the ACRS Subcommittee

South Texas Project Units 3 and 4
COL Application Review

SER Phase 4 Chapter 22.2
Requirements Resulting From Fukushima Near-Term Task Force Recommendation 4.2
"Mitigative Strategies"

December 3, 2014

Staff Review Team Chapter 22.2

- **Project Managers**

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  - Rocky D. Foster, DNRL/LB2, Project Manager

- **Technical Staff Review Team**

  - Chang Li, SPSB, Senior Reactor Systems Engineer
  - Thomas Scarbrough, MEB, Senior Mechanical Engineer
  - Sheila Ray, NRR/EEEB, Senior Electrical Engineer
  - James Gilmer, SRSB, Reactor Systems Engineer
  - Nan Chien, SCVB, Reactor Systems Engineer
  - Hanry Wagage, SCVB, Senior Reactor Systems Engineer
  - Sunwoo Park, Structural Engineer

Technical Topic
Chapter 22.2

- Chapter 22.2 Near-Term Task Force (NTTF)
  Recommendation 4.2
  Mitigative Strategies

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Background

- March 11, 2011, Great Tohoku Earthquake and Tsunami in Japan
- July 12, 2011, SECY-11-0093 included twelve NTTF recommendations
- September 9, 2011, SECY-11-0124 addressed NTTF recommendations that could provide near term safety improvement
- October 3, 2011, SECY-11-0137 prioritized the NTTF recommendations
- February 17, 2012, SECY-12-0025 proposed orders and requests for additional information (RAIs) to be issued

Background (cont'd)

- March 12, 2012: Orders EA-12-049 and EA-12-051 issued
- Beginning in 2012, NRC staff issued RAIs to NINA for STP 3 & 4 actions on NTTF Recommendations 2.1, 4.2, 7.1, and 9.3
- June 25, 2012: In response to RAIs, NINA added Appendix 1E, "Response to NRC Post-Fukushima Recommendations," to the STP 3 & 4 FSAR
- April 9, 2014: NTTF Recommendations 2.1, 7.1 and 9.3 presented to ACRS

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Review Approach

- The NRC staff reviewed the STP submittal consistent with NRC Order EA-12-049 using guidance in JLD-ISG-2012-01, which endorsed NEI 12-06, with exceptions and clarifications.

- The Order states that mitigation strategies must be capable of mitigating a simultaneous extended loss of all ac power (ELAP) and a loss of normal access to the ultimate heat sink (LUHS), and must provide adequate capabilities to address challenges to core cooling, containment function, and SFP cooling for all modes of operation at all of the operating units on a site.

- The Order specifies a three-phase approach using installed equipment and resources for the initial phase, portable onsite and offsite equipment and resources for the transition phase and final phase respectively.

- The Order specifies that the equipment being relied on for mitigation strategies must be reasonably protected from external events.

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Review Areas

- Phased approach and acceptance criteria,
- Core cooling,
- Containment function,
- SFP cooling,
- Power supply,
- Water and fuel supplies,
- Ventilation (control room habitability and equipment cooling),
- Instrumentation and emergency lighting,
- FLEX equipment and offsite resources.
- Evaluation of external hazards,
- Protection of equipment (structure),
- Mechanical equipment capability and programmatic controls.
- Multiple units at the site;
- Programmatic controls, including equipment maintenance and availability testing, procedures and training,
- Use of license conditions.

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Phased Approach

In response to RAI 01.05-5, the applicant provided the "STP 3&4 ABWR FLEX Integrated Plan", which proposed a two-phase approach:

- Initially cope by relying on installed plant equipment for 36 hours (Phase 1).
- Obtain additional capability and redundancy from offsite equipment for an indefinite duration (Phase 3).

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Phased Approach (cont'd)

- The duration of 36 hours is sufficiently long compared to the duration of 24 hours in the guidance of NEI 12-06 for the combination of initial phase and transition phases. Onsite portable equipment are available for defense-in-depth purpose, but are not relied upon to perform the functional requirements.

- The functional requirements of core cooling using reactor core isolation cooling (RCIC) and AC-Independent Water Addition (ACIWA) systems, containment function using containment overpressure protection system (COPS), and SFP cooling using ACIWA can be satisfied by installed equipment. In Phase 3, portable pumps are used to support ACIWA system and FLEX diesel generators to provide power supplies.

- The proposed two-phase approach, which provides adequate capabilities to address the functional requirements of core cooling, containment and SFP cooling, serves the same purpose as the three-phase approach in Order EA-12-049.

- The staff finds the proposed approach acceptable.

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Core Cooling

- If ELAP occurs when in Modes 1, 2 or 3, the RCIC pump starts automatically on low Reactor Pressure Vessel (RPV) level signal.
    - RCIC suction initially aligned to Condensate Storage Tank (CST), but automatically switches to Suppression Pool (SP) on High SP level signal
    - ABWR DCD credits RCIC operation for Station Black-Out (SBO) for up to 8 hours
    - MAAP code analysis justify extended RCIC operation to at least 36 hours with manual control
    - Phase 3 core cooling is provided by ACIWA system
- If ELAP occurs when in Modes 4 or 5, the ACIWA system can be used to maintain core cooling due to lack of steam pressure (depressurization of RPV by a safety relief valve is needed in Mode 4)

Core Cooling (cont'd)

- RCIC system is an advanced steam-driven turbine/pump system with a mono-block, totally self-lubricated design
- RCIC pump has a 250 F bearing design temperature limit
- Long-term cooling by ACIWA with water make-up and fuel supplied by Phase 3 equipment
- MAAP code calculation audit of August 20, 2014
  - Staff agrees that MAAP is an appropriate code for this analysis
  - Applicant made conservative assumptions regarding CST inventory

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Containment Function/Ventilation

- Containment function is maintained by the use of the COPS
- COPS is a hardened passive vent system with rupture disk that actuates at 90 psig
- COPS vents from the suppression pool through the plant stack which has a radiation monitor powered by Class 1E power
- COPS remains available throughout Phase 1 and Phase 3
- COPS is located in Reactor Building and provides containment cooling while ensuring containment structural integrity

Containment Function/Ventilation

- RCIC Room Temperature Analysis
  - Phase 1
  - Environmental Qualification – RCIC room door/overhead hatch & stairwell door opened to allow for natural circulation
  - Reference DCD Chapter 3, Appendix 3I

- Remote Shutdown System (RSS) Room (Phase 1) and Main Control Room (Phase 3) Heat-Up Analysis
  - Habitability – Stairwell door opened to allow for natural circulation
  - Table D-2 of NUREG/CR-6146, "Local Control Stations: Human Engineering Issues and Insights"

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SFP Cooling

Proposed Strategy

- Allowing the water in the SFP to boil from 23 feet above the top of the fuel racks to 10 feet above the top of the fuel rack, during the first 36 hours into ELAP,

- Monitoring SFP water level,

- Using installed equipment, ACIWA system, and water from Firewater Storage Tank (FWST) or Ultimate Heat Sink (UHS), to make up the water as needed to maintain the SFP water level 10 feet above the top of the fuel rack after 36 hours into ELAP.

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SFP Cooling (cont'd)

Staff Review

- SFP water will be maintained 10 feet above the top of the fuel rack, which has sufficient margin to prevent fuel damage.
- ACIWA can provide water makeup for an extended period of time without ac power.
- As indicated in response to RAI 01.05-22, the applicant clarifies the ACIWA realignment. In Phase 3, SFP water makeup, if needed, is provided by manually opening valves F14C and F15C (Loop C double isolation between residual heat removal (RHR) Loop C and the fuel pool cooling). The connection at RHR Loop C is in the reactor building. The installed ACIWA pump provides flow to the RHR system piping and then to the SFP.
- The staff finds the proposed approach acceptable.

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Water and Fuel Supplies

Proposed Strategies

- In Phase 1, RCIC takes water from the SP or CST, which is sufficient for the 36-hour Phase 1 period for core cooling. No water supply is needed for the containment function or SFP cooling during Phase 1.
- In Phase 3, ACIWA system takes water from one of the two FWSTs for core and SFP cooling. Once the water in the FWSTs is depleted, operator will shift the ACIWA suction to UHS, which has a water volume of approximately 16 million gallons. The UHS basin can be filled as needed via a restored well water system or tanker truck.
- A permanent piping connection to allow the ACIWA system to take suction from the water volume in the UHS basins will be installed.
- The RHR system provides the piping and valves that connect the ACIWA piping with the RHR Loop C pump discharge piping. Manual valves permit adding water from the FWSTs to the RHR system.

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Water and Fuel Supplies (cont'd)

Proposed Strategies (cont'd)

- A single ACIWA pump can provide enough flow to maintain the vessel level for both units and still have sufficient flow to provide makeup for both SFPs.

- A backup to the pump is provided by a connection on the outside of the reactor building, which allows hookup of the ACIWA to a fire truck pump or trailer mounted pump.

- The ACIWA pump is designed with a minimum of 36-hour fuel supply.

- In Phase 3, operators will need to transfer diesel fuel oil, as necessary, from one of the three underground EDG fuel oil storage tanks to the ACIWA fuel oil storage tank using a staged portable pump and a small portable diesel generator.

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Water and Fuel Supplies (cont'd)

Staff Review

- In the response to RAI 01.05-32 , the applicant clarified that the permanent piping to allow the ACIWA system to take suction from the water volumes in the UHS basins will be seismically designed. This piping will be robust, sub-surface, and protected from site hazards.

- The response proposes to revise FSAR Appendix 1E, Section 1E.2.4 to reflect this clarification.

- In Attachment 3 of the "FLEX Integrated Plan," all the pumps and valves with power sources being used for the mitigation strategies are identified.

- The staff finds that the applicant has demonstrated sufficient capability regarding water and fuel supplies and pumping mechanisms for Phase 1 and Phase 3 mitigation strategies.

Reasonable Protection

- Order EA-12-049 specifies that the equipment being relied on for mitigation strategies must be reasonably protected from external events.
- According to NEI 12-06, this equipment should be designed to be robust and housed in robust buildings. Robust is defined as meeting the current plant design basis for the applicable external hazards with respect to seismic events, flood, and high winds and associated missiles.
- The review of the mitigation equipment and the protection levels for external events is set at a design basis level.
- The installed RCIC, ACIWA, and COPS are seismically qualified and are contained within robust structures that provide adequate protection against the applicable extreme hazards for the site.

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Reasonable Protection (cont'd)

- ACIWA valves connecting to the RHR loop C are contained in the reactor building and the battery rooms are in the control building. Both buildings are Seismic Category I structures designed to withstand the effects of design basis external hazards.

- Onsite portable equipment including portable diesel generators and diesel-powered pumps and associated hoses and fittings is stored either in Seismic Category I structures or structures that are designed to withstand the effects of applicable external events.

- UHS is a Seismic Category I structure.

- The staff finds that the equipment being relied on for mitigation strategies will be reasonably protected from external events, consistent with the provisions of Order 12-049.

NTTF Recommendation 4.2
“Mitigative Strategies”
Power Supplies

- STP DC Power Systems
  - 4 Class 1E 125 VDC divisions – one battery per division
  - 1 non-Class 1E 125 VDC battery
  - 1 non-Class 1E 250 VDC battery

- Phase 1 – only available power sources are Class 1E 125 VDC station batteries
  - 36 hours via load shedding
  - Ensure battery divisions can provide power to the corresponding loads to maintain core cooling, containment, and SFP cooling

- Phase 3 – 2 FLEX 480 V, 1500kW diesel generators
  - Sufficient capacity to power the loads
  - Electrical isolation is maintained between the safety-related system and the FLEX power supplies

NTTF Recommendation 4.2 "Mitigative Strategies" Power Supplies

- Phase 1 – only available power sources are Class 1E 125 VDC station batteries
  - Staff reviewed battery sizing calculation and confirmed the adequacy of the power supply
  - Staff performed 5 audits to support this portion of the review
  - Confirm battery sizing was performed (i.e. methodology) in accordance with IEEE Std. 485 and RG 1.212
  - Review battery duty cycle – loads and corresponding timeline
  - Ensure minimum battery voltage is met
  - Review environmental conditions of battery room
  - License condition to ensure battery calculation will be finalized based on as-built equipment characteristics
  - Ensure batteries can support duty cycles greater than 8 hour qualification

NTTF Recommendation 4.2 "Mitigative Strategies" Mechanical

As indicated in response to RAI 01.05-24:

- All safety-related pumps, valves, and snubbers used in mitigation strategy are permanently installed equipment, and not relied on to perform functions beyond those credited in the design basis (except RCIC suction from SP will be allowed to increase to 250 F qualification temperature of RCIC pump bearings).

- All nonsafety-related pumps, valves, and snubbers used in mitigation strategy are permanently installed equipment, and not relied on to perform functions beyond those specified in ABWR DCD and STP 3 & 4 FSAR.

- Portable pumps used in mitigation strategy are two portable pumps used to transfer fuel oil to ACIWA fuel oil storage tank from diesel generator fuel oil storage tanks.

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NTTF Recommendation 4.2 "Mitigative Strategies" Mechanical

As indicated in response to RAI 01.05-25:

- Design, manufacture, testing, installation, and surveillance to provide assurance of seismic, environmental, and functional capability of safety-related pumps, valves, and snubbers used in mitigation strategy for an ELAP are specified in ABWR DCD and STP 3 & 4 FSAR.

- RCIC net positive suction head (NPSH) margin with increased SP temperature and containment overpressure acceptable based on conservative NPSH assumptions until suction shifted to CST when SP temperature reaches 250 F.

- Plant operators will monitor RCIC pump operation for adequate NPSH and will shift RCIC suction to CST if cavitation indicated.

- If RCIC becomes unavailable, plant operators will shift reactor vessel injection to the ACIWA system.

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NTTF Recommendation 4.2
"Mitigative Strategies"
Mechanical

As indicated in response to RAI 01.05-26:

- All nonsafety-related pumps, valves, and snubbers used as part of mitigation strategy are part of ACIWA portion of the Fire Protection System (FPS).
- Design, manufacture, testing, installation, and surveillance requirements in ABWR DCD and STP 3 & 4 FSAR.
- Testing performed in accordance with Fire Protection Program and Maintenance Rule Program.
- ACIWA and FPS included in Design Reliability Assurance Program (D-RAP) and Maintenance Rule scope.
- FLEX Integrated Plan specifies ACIWA system is seismically qualified and contained within robust structures.
- ABWR DCD Chapter 14 specifies FPS preoperational testing.
- STP 3 & 4 Reliability Assurance Program and QA Program specify quality requirements for these components.

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NTTF Recommendation 4.2 "Mitigative Strategies" Mechanical

As indicated in response to RAI 01.05-27:

- Only portable equipment for ELAP mitigation strategy are two 120V pumps used to transfer fuel oil to ACIWA fuel oil tank from diesel generator fuel oil storage tanks.
- Portable pumps will be procured as commercial grade in accordance with STP 3 & 4 Quality Assurance Program.
- Detailed procedures will be developed for determination of critical characteristics to ensure commercial grade item is suitable for intended use.
- Quality evaluation will be performed during implementation of Operational Programs indicated in FSAR Section 13.4S.

NTTF Recommendation 4.2 "Mitigative Strategies" Mechanical

As indicated in response to RAI 01.05-28:

- Specific operational programs listed in FSAR Section 13.4S will provide assurance of the functional capability of the pumps, valves, and snubbers used in mitigation strategy.

- Applicable operational programs include, for example, Fire Protection Program, Maintenance Rule, Motor-Operated Valve Testing Program, and Initial Test Program.

- Planned license condition will verify administrative program for configuration control, maintenance, and testing of equipment used in mitigation strategy with requirements for preventative maintenance, and testing procedures and frequencies.

NTTF Recommendation 4.2 "Mitigative Strategies"

License Condition

- Complete FLEX Integration Plan to maintain core cooling, containment, and SFP cooling capabilities during a simultaneous ELAP and LUHS:
  - Plant procedures
  - Guidance & strategies
  - Installation of FLEX equipment
  - Training program
  - Administrative control for configuration control, maintenance & testing
- Fully implement guidance & strategies for:
  - Procedures
  - Training
  - Acquisition, staging or installation of equipment & consumables
  - Configuration controls, provisions & procedures for maintenance & testing
- Perform a habitability analysis of the RCIC room, RSS room and the Main Control Room
- Update the design calculation for the Class 1E battery discharge to reflect "as-built" plant design
- Complete an integrated system validation of the ELAP timeline
- Maintenance of the guidance & strategies program

NTTF Recommendation 4.2
"Mitigative Strategies"

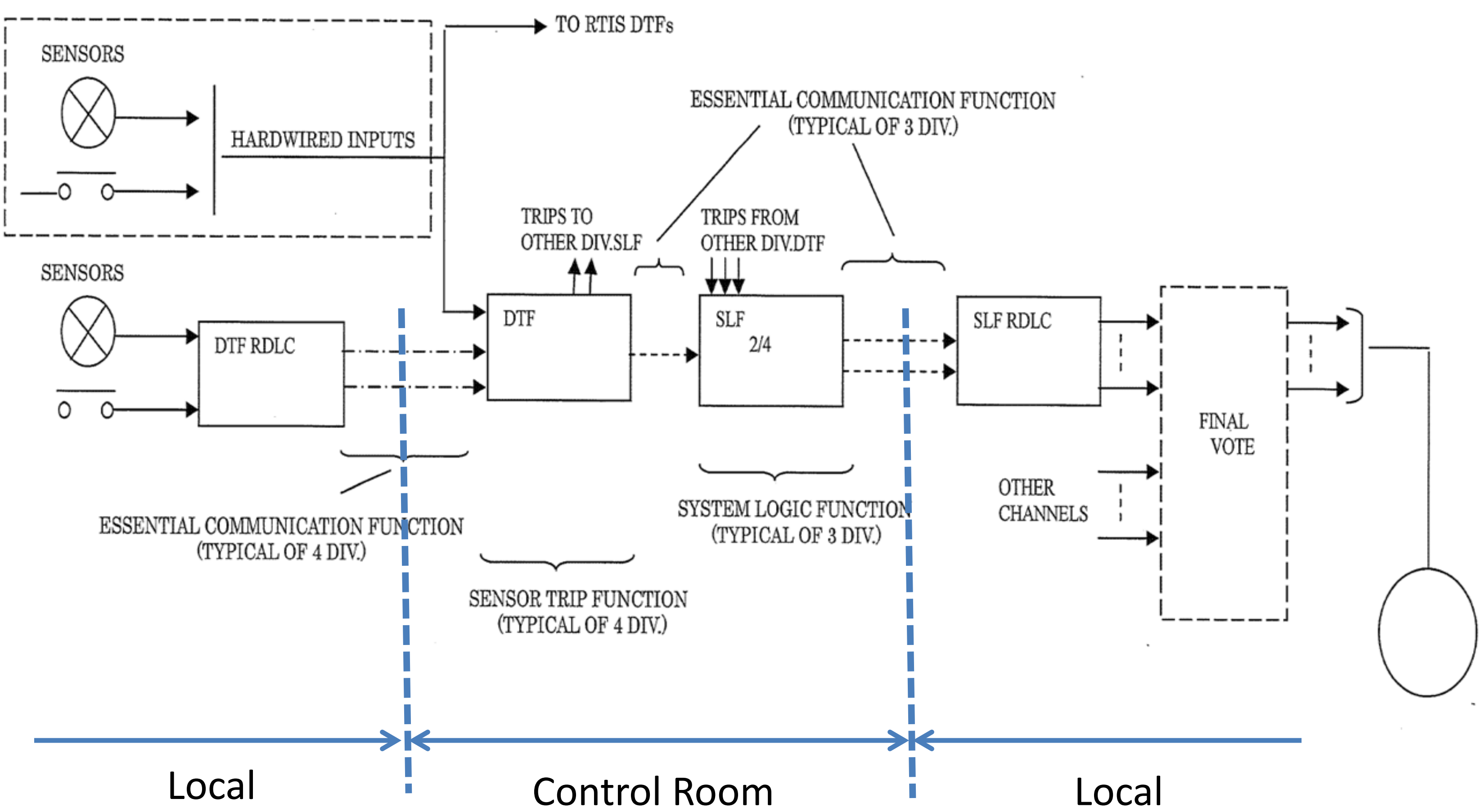
Discussion/Committee Questions

ACRS Action Item 64

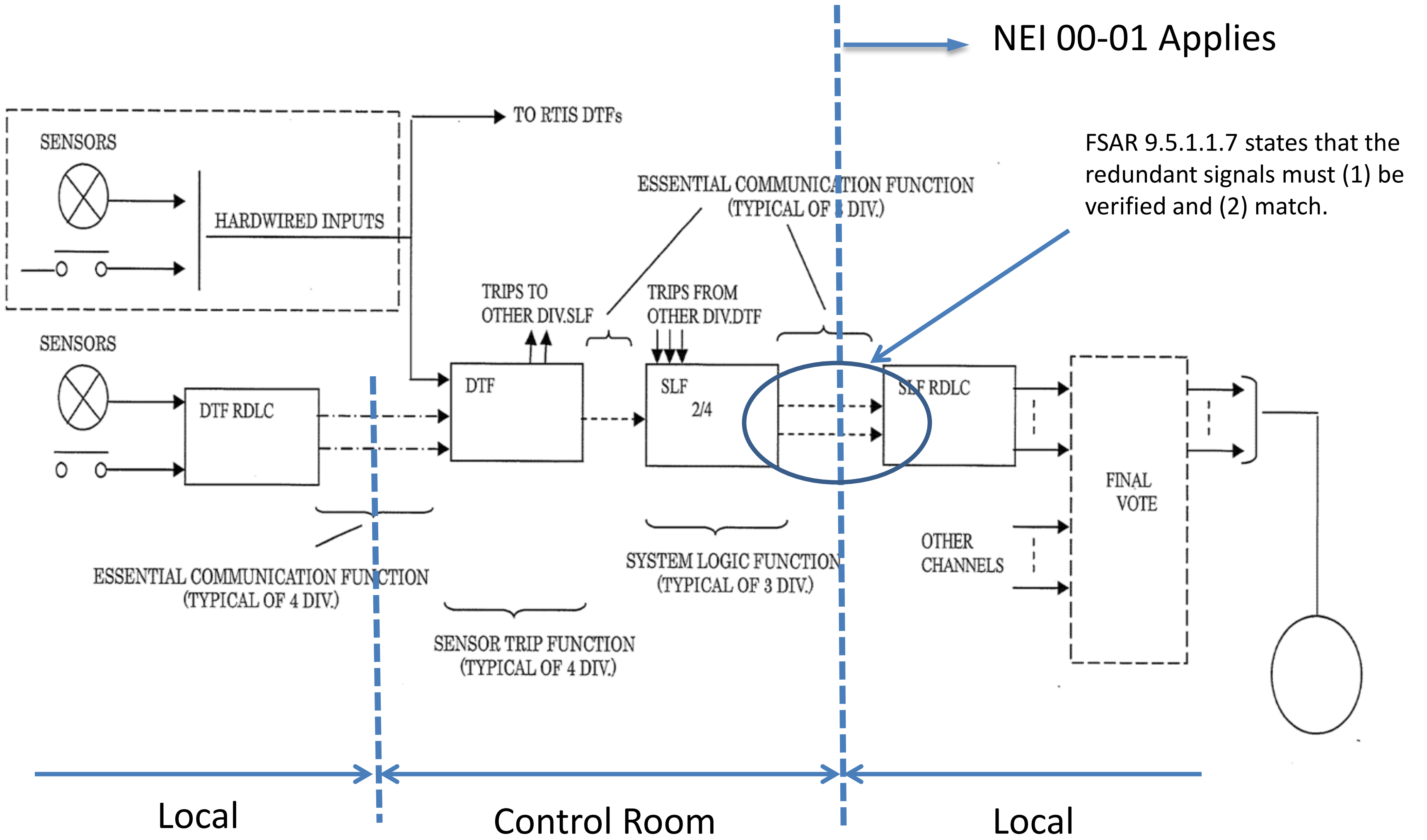
Fire Induced Spurious Signals from DI&C Cabinets with Fiber Optic Cables

12/3/2014

ESF Logic and Controls System (ELCS) Block Diagram



ESF Logic and Controls System (ELCS) Block Diagram



FSAR 9.5.1.1.7 Spurious Control Actions

- As stated above, the [ESF] systems are separated by fire areas on a divisional basis.
- The ESF Logic and Control System (ELCS) utilizes redundant fiber optic links to communicate ESF system level actuation status to the Remote Digital Logic Controllers (RDLCs), which control the remote input/output functions and the actuation of the electromechanical components.
- The RDLC utilizes diagnostics to **verify the validity** of each redundant message.
- The **redundant messages** received by the RDLC must **match** for component actuation to occur.
- The probability of spurious messages occurring on each of the redundant links that both pass the communication diagnostics and that also match between the two redundant links is essentially zero.

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Presentation to the ACRS Subcommittee

South Texas Units 3 and 4 COL Application Review

Action Item #64: Fire-Induced Spurious Actuations in DI&C

December 3, 2014

Staff Review Team

- **Technical Staff**
  - Dennis Andrukat, SPSB (Presenter)
  - Dinesh Taneja, ICE2
  - Joe Ashcraft, ICE2
  - Wendell Morton, ICE2

- **Project Management**
  - Tom Tai, Lead PM
  - Luis Betancourt, Chapter PM

Fire Protection Review:
Action Item #64

Background

- October 20, 2010 – ACRS Subcommittee
  - ACRS raised the concern regarding adverse effects due to fire on digital equipment

Conclusion

- NRC staff finds reasonable assurance that a fire will not prevent the ability to achieve and maintain safe shutdown.

Fire Protection Review:
Action Item #64

Evaluation

- Applicant will follow NEI 00-01 and RG 1.189 for the hardwire portions of the electrical and I&C systems

- The staff finds the I&C architecture contains robust features (e.g., diversity, redundancy, reliability)

Fire Protection Review:
Action Item #64

Evaluation

- Additional Layers of Protection:
  - Hardwire portions can be bounding
  - Each safety division physically and electrically isolated
  - Voting logic also helps maintain this isolation

Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- COL – Combined License
- DI&C – Digital Instrumentation and Control
- I&C – Instrumentation and Control
- ICE2 – Instrumentation, Controls and Electronics Engineering Branch 2
- NEI – Nuclear Energy Institute
- NRC – Nuclear Regulatory Commission
- PM – Project Manager
- RG – Regulatory Guide
- SPSB – Plant Systems Branch