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UNITED STATES NUCLEAR REGULATORY COMMISSION'S

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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621ST MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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THURSDAY,

FEBRUARY 5, 2015

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman
DENNIS C. BLEY, Vice Chairman
MICHAEL L. CORRADINI, Member-at-Large
SANJOY BANERJEE, Member
CHARLES H. BROWN, JR., Member
DANA A. POWERS, Member
HAROLD B. RAY, Member
JOY REMPE, Member
PETER C. RICCARDELLA, Member
MICHAEL T. RYAN, Member
STEPHEN P. SCHULTZ, Member
GORDON R. SKILLMAN, Member

DESIGNATED FEDERAL OFFICIAL:

MAITRI BANERJEE
QUYNH NGUYEN

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

(8:31 a.m.)

CHAIRMAN STETKAR: The meeting will now come to order.

This is the first day of the 621st meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following: final safety evaluation report associated with the South Texas Project Units 3 and 4 combined license application referencing the advanced boiling water reactor design, review of the Generic Letter on treatment of natural phenomena hazards in fuel cycle facilities, the Watts Bar 2 -- Unit 2 operating license, NUREG-0800 standard review plan for the review of safety analysis reports for nuclear power plants, LWR edition, Sections 3 -- 13.1.2 and 13.1.3 operating organization, and preparation of ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Ms. Maitri Banerjee is the Designated Federal Official for the initial portion of the meeting.

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

There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed in the listen-in mode during the presentations and Committee discussions.

A transcript of portions of the meeting is being kept. It is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient and clarity and volume, so that they can be readily heard. And I'll remind everyone to please turn off all of your little beepy devices.

I will begin with two items of current interest. Mr. Mark Banks has been selected as Chief of the Technical Support Branch for the Advisory Committee on Reactor Safeguards. Mr. Banks joined the U.S. Nuclear Regulatory Commission in 2010 as a technical advisor in the Office of the Inspector General. In 2012, Mr. Banks was selected as a senior staff engineer in the ACRS.

Prior to joining the NRC, he worked as a licensing project manager with the Yucca Mountain Project for the Department of Energy. Mr. Banks also worked in the nuclear industry at the Kewanee, D.C. Cook, and Palisades nuclear power plants in the areas of reactor engineering and operations.

He holds a bachelor's of science degree in mechanical engineering from the University of Utah and a master of science in nuclear engineering from the University of Arizona. Congratulations, Mark, wherever you are. And condolences.

(Applause)

Also, I'd like to welcome the return of Derrick Widmeyer, Senior Engineer to the ACRS staff. Previously, Derrick was a Project Manager in the Office of Nuclear Materials Safety and Safeguards working on the safety evaluation report for the Yucca Mountain Project. And as best as I can tell, Derrick just can't get enough of a good thing. Welcome back, Derrick, wherever you are.

(Applause)

And with that, we will begin with the first item on our agenda, and that is the safety evaluation report for South Texas Units 3 and 4. And I'll turn it over to Dr. Corradini.

MEMBER CORRADINI: Thank you, Chairman Stetkar. So we have been reviewing the NRC safety evaluation report now for NINA, combined operating license for South Texas, for a while, since March of 2010. The proposed STP Units 3 and 4 will be a certified ABWR design with certain departures. The application conforms to the design centered review approach.

And just to remind everybody, we've had a plethora of meetings -- 22 to be exact -- on the COLA and the SER, and we've written two letter reports, one interim letter on various chapters with open items, and the other one on long-term cooling. We have also written a letter on the safety aspects of the application of the certified design to incorporate air impact assessment rule requirements.

So at today's briefing we expect to complete this long review process. We have selected -- or I should say I have asked NINA and the staff to focus on a few subjects -- implementation of the Fukushima and TTF recommendations; the site characteristics, in particular design basis flood; response to the Bulletin 2012-01 on electrical open phase issues; and a remaining question we had on spurious signals from digital I&C containing only fiber optic cables; and the influence of high temperatures and/or fire.

Other than that, I would point out that I wanted to thank both NINA and the staff. I have not been in attendance in the early meetings, although a couple, and I wanted to thank them for all of these years of effort. I think it has actually turned out well. I personally have learned a lot about the design, and also a whole lot about electrical engineering, whether I wanted to or not.

So this portion of today's meeting is open to the public. Let me start with Tom Tai of the NRO staff as the Project Manager to start us off. Tom?

MR. TAI: Thank you. Good morning. My name is Tom Tai. I'm the lead PM for STP project. It has been a long journey. I want to thank ACRS for being so patient with us and all of their help. So with that, I hope we have a good meeting today and close out all the issues and move on.

And I would like to introduce Sam Lee, our Branch Chief, who will say a few words before we start.

MR. LEE: Good morning. Mr. Chairman, members of the Committee, my name is Sam Lee. I'm Chief of Branch -- Licensing Branch 2 in Office of New Reactors. I just wanted to add my thanks to the Committee. It has been a long journey. We look forward to this meeting. I know you have some questions -- remaining questions on the issues at hand here.

I just want to thank you for this meeting, and also thank you for taking this journey with us in the last several years. Your feedback and questions have been helpful toward our endeavor to develop a high quality safety evaluation. So we look forward to our meeting today.

MEMBER CORRADINI: Thank you. Why don't we -- I think we're going to go right to the NINA staff. Scott, you're going to --

MR. HEAD: Sure.

MEMBER CORRADINI: -- start us off and introduce your folks?

MR. HEAD: Yes, sir. But I want to take a little detour here, because I was going to make that speech at the end of all of this, but apparently we should do it now, and I will.

MEMBER CORRADINI: You can do it whenever you want.

MR. HEAD: Well --

MEMBER CORRADINI: This is a free country.

MR. HEAD: I understand. But -- because I was reflecting on the long journey, and I wanted to for myself and my colleagues and NINA and the team that has been presenting to ACRS over these years, I -- we appreciate the ACRS hospitality and the interactions that we've had, and we understand the value of this interaction and how important it is to the overall process.

And I know that it might have been at some point in time, you know, where do you get the energy when you're questioning whether a project is ever really going to come to fulfillment or not. But I'll tell you, we are still very optimistic that this plant is going to be built and that all of this was a worthwhile endeavor. So, like I say, I certainly do appreciate it.

MEMBER CORRADINI: Good. Thank you.

MR. HEAD: Yes. We're going to cover the topics you talked about today. In attendance is Steve Thomas, who has been our Engineering Manager at the project since its inception, and he has briefed the ACRS on a number of topics. Bill Mookhoek is our Licensing supervisor. Bill joined STP in the '80s from the Nuclear Navy, and he was a shift supervisor at 1 and 2 for a number of years, and that was an important perspective for us to have as we addressed the Fukushima aspects, especially with respect to FLEX, and we certainly appreciated that insight.

Jim Tompkins is here. He has also been with the project since its inception and has briefed the ACRS on a number of topics. Evans Heacock is here today with us. Evans is responsible for the layout and design -- fundamental design of the switchyard and applying lessons learned from 1 and 2 and other industry aspects. And like I say, we're -- as you probably have heard over the last couple of years, we're quite proud of what our switchyard is and how it addresses a number of issues that we have.

And since of all of those people on there I know the least, I will be doing the brief today. The agenda will be the STP main cooling reservoirs, especially as it reflects on the design basis flood. We are going to discuss the ABWR extended station blackout capabilities, and we said it that way on first, because we're again to talk about the ABWR, STP ABWR, and its capabilities, and then of course we will also address the extended loss of AC power.

We are going to discuss the open phase condition and then a short discussion on fire-induced spurious signals, and we look forward to that discussion.

You've seen a picture like this a number of times in our interactions. It shows the prominent feature of the South Texas site, and it shows one of the major reasons that 3 and 4 is being built there is the main cooling reservoir. It is in fact large enough for both -- all four units, and that's why I say we -- it's a primary aspect of some of our decisions to move forward with 3 and 4.

As part of our efforts, we obviously had to look at storm surges, upstream dam failures, probable maximum precipitation, tsunamis, all of the -- a number of different potential flooding aspects that could happen at the site, but the main cooling reservoir and the embankment ends up defining the design basis flood level for us. And so we were going to talk about that today.

The reservoir is 12.4 miles around. It is impoundment. The embankment is at an elevated embankment all the way around. It encloses a 7,000-acre -- 7,000 acres, and it's normally -- or it could -- up to 200,000 acre-feet of water. So it's constructed above natural grade. The minimum embankment crest elevation is 65.8 feet, and that ends up being important to us from an overtopping standpoint, since at that elevation we are not required to consider overtopping.

The maximum operating level is -- it will be 49 feet above main sea level, and that's the maximum operating level. It's an interesting aspect of the -- there is normally a filling season and an evaporating season at a reservoir like this. So quite often you're not at the maximum operating level very long, but that is our design. That is what we start with from a design basis standpoint.

Here is another picture that I want to -- I was going to use to describe the design basis flood. And on the next slide there's actually a scorecard and another demonstration. But let's -- I'm going to stay on this one for now.

(Interrupted by phone ringing.)

CHAIRMAN STETKAR: Just ignore it.

MR. HEAD: Okay. So --

(Interrupted by phone ringing.)

CHAIRMAN STETKAR: Just try to ignore it.

MR. HEAD: So --

MEMBER CORRADINI: Are you expecting somebody to call in?

MR. HEAD: Yes, sir.

MEMBER CORRADINI: Okay.

MR. HEAD: But they have the number and have called in, so --

MEMBER CORRADINI: Okay. Fine.

MR. HEAD: I knew it could be my fault, but that's okay.

(Laughter)

MEMBER CORRADINI: It was just a question.

CHAIRMAN STETKAR: I little defensive, are we?

MR. HEAD: So 3 and 4 will be located over in this area, and the switchyard will be -- for 3 and 4 will be like over in this area. And so the design basis flood is developed for us by assuming a breach in this location directly, you know, ultimately downstream from the 3 and 4 location. And for this analysis we used an equation that would develop the ultimate breach size, and then we used another equation to develop the breach time, and with that information we factored it into another equation that would define the outflow, and then that led into another equation that -- or calculation that defined the flood level as it went towards the site.

MEMBER CORRADINI: Just to be clear --

MR. HEAD: Sure.

MEMBER CORRADINI: -- as I remember, these are typical analyses that are -- I don’t want to say that are required, but are essentially considered to be conservative in spread of the waters and --

MR. HEAD: Yes, sir. The modeling, once we get -- the crucial thing is to define the break width and timing.

MEMBER CORRADINI: Right.

MR. HEAD: And width being I think the most important thing. And then from then on it's a calculation that defines overtime, what the elevation is. There are a number of conservatisms that have been applied to this analysis. Like I say, we grew the breach in what is basically we think an impossible timeframe.

And we confirmed our assumptions with another model that validated what we believe is the conservative nature of our conclusions, and so we believe that the flood level that we have generated at the plant site is in fact conservative.

So any questions before we go to the next slide?

MEMBER BANERJEE: What -- you said at an impossible rate you grew the breach?

MR. HEAD: Yes, sir.

MEMBER BANERJEE: What was the rate?

MR. HEAD: Well, the equation that we used to develop the breach width would say it would take seven hours to develop that breach, and we assumed it happened in 1.7 hours. And so, you know, by the time it's complete, the elevation is still basically the same at the -- with the head of the -- from the breach is still there.

So that -- like I say, that was just one of the conservatisms that we included, and I'll show you another one here in a second.

MEMBER BANERJEE: Who developed this, the Army Corps of Engineers or --

MR. HEAD: No. The equation we used was from a gentleman named Froelich in the mid-'90s, and it is considered the state of -- and this is a regression analysis based on other breaches or other embankment failures, dam failures that have happened, and looking at -- like I say, there was a regression analysis. It's considered the most sophisticated of the regression analyses and --

MEMBER BANERJEE: Are there uncertainty brands on this?

MR. HEAD: There is uncertainties. As we discussed previously, we did not explicitly use the uncertainties. Our approach was to add conservatisms and add margins as we went through the process.

MEMBER BANERJEE: Sort of a lower -- a more conservative approach to -- the regression analysis presumably gave you a best fit of some sort.

MR. HEAD: Yes, sir. Yes, sir.

MEMBER BANERJEE: Okay.

MR. HEAD: That's right. It's interesting. In the model that we used, the breach model, which is -- and actually we modeled the hydrodynamics, soil structure, soil interactions, and stuff, that give us a substantially lower number than what is -- what we came up with, the analysis, the method we used. And that particular model was also very conservative, and so we think there may be a factor of four or more or less actually in terms of the breach than what we considered for our design basis flood level.

MEMBER BALLINGER: Now, the reservoir has a liner?

MR. HEAD: No, sir.

MEMBER BALLINGER: Okay. No liner. Okay.

MR. HEAD: Well, it has a clay soil liner.

MEMBER BALLINGER: Clay soil liner.

MR. HEAD: I mean, nothing -- I mean, it is -- there is leakage or, you know, that we assume it is happening. It's happening today. It's a part of an impounded reservoir like this, so it's -- I mean, and the -- maybe speaking to that, the potential mechanisms for, you know, a breach is overtopping, which I mentioned earlier, based on our elevations we don't have to consider. We've done a seismic analysis of the reservoir, and based on its -- you know, the clay material and everything else, the stability of it is satisfactory from a seismic standpoint.

So we assume piping is the failure mechanism that the water somehow does end up appearing on the downstream side, causing a mechanism to remove the embankment material and then ultimately the face moves back up and causes debris. So that's the mechanism that is assumed.

MEMBER BANERJEE: So what is the physical flooding level? Is it 20 feet or --

MR. HEAD: Here we go.

MEMBER BANERJEE: Perfect.

MR. HEAD: We have had a number of different pictures up during the subcommittee meetings, and we said this one sort of summarizes it all. On the left side you see the elevation we start with, which is greater than 49 feet. We assume a significant rainfall and some wind setup, and then we -- at that level we start the breach to occur.

You see the 1,700 feet that is out to the very south side of the first building that is in the power block area. You see the power block elevation. That's the average elevation at the reactor vessel or the reactor building. It's really 36-1/2 feet, okay, for drainage reasons.

Design basis flood, we selected after we concluded that the peak water level is 38.8. We added an extra foot or so to the design basis flood. And then, the available physical margin is something we did subsequent to Fukushima to ensure there were no openings in the plant design less than 51 feet. And so that kind of encapsulates the -- how we got here from design basis flood standpoint and the elevations that result that are important to --

MEMBER BANERJEE: What you mean by that is that you could withstand a flood of 51 feet?

MR. HEAD: Yes, sir.

CHAIRMAN STETKAR: Scott, aren't there some doors that they have to close? When you say there's no openings below 51 feet, aren't there some doors that --

MR. HEAD: Yes. There's a number of doors all the way out to 51 feet, yes, sir. And they have to --

CHAIRMAN STETKAR: They are watertight doors that are normally closed, or are they --

MR. HEAD: The watertight doors at the elevation are -- that is, the 40-foot level elevation, are closed all the time. We have committed to having them closed all the time.

CHAIRMAN STETKAR: Okay.

MR. HEAD: Okay? That's something we probably will want to revisit at some point in time, because --

CHAIRMAN STETKAR: I was going to say, closed all -- even during outages and -- I mean, all the time.

MR. HEAD: Yes, sir.

CHAIRMAN STETKAR: Okay.

MR. HEAD: Okay? And that's actually -- based on the timing that we believe is available to us to get those doors closed, that may be something that we have to revisit at some point in time. But right now what we're licensing is --

CHAIRMAN STETKAR: But now you're licensing, it's --

MR. HEAD: yes, sir.

CHAIRMAN STETKAR: -- tight to 40 feet.

MR. HEAD: Yes, sir.

MEMBER BANERJEE: How long does it take, about an hour or what?

MR. HEAD: Well, a little over an hour to reach the design basis flood level at the site. And because of the way we've done it, immediately after you stop growing the breach, it basically starts going down because now you're emptying the reservoir and the head of the flood is going away. And so it almost immediately starts going down. That's not the way it would really happen, but it does give us some timing aspects that we feel are important to recognize. And we will recognize those later on when we talk about Fukushima.

MEMBER CORRADINI: So, Scott, maybe my notes are off. So let me tell you what I have written down, and then you tell me if I have made an error. What I thought I heard in the past was that you have some EOPs that require operator action to close doors between 40 and 51 feet. Is that incorrect?

MR. HEAD: No. We probably have said that at some point in time, and what would have -- that may have been maybe even pre-Fukushima or pre-us. Available physical margin is something we adopted as part of our post-Fukushima --

MEMBER CORRADINI: Okay. So it would just be --

MR. HEAD: But the EOPs, even if they are all closed all the times, they will designate people to go out and ensure they're still closed.

MEMBER CORRADINI: All right.

MR. HEAD: So even if they're closed, you're going to have either security officers or plant operators going out ensuring they're closed.

VICE CHAIRMAN BLEY: I think this is a change. There was a time we talked about how much time it would take to close certain doors, especially some big ones, and there were some challenges about that. But now this is a different approach.

MR. HEAD: In reality, you know, when this starts, okay, it will not be a slow news item at the site, and basically you're going to -- you're losing four units for a number of years, okay, and so it's going to be a big deal. And there will be a number of reactions. There will recognitions to -- the procedures recognize right now that you're going to be shutting all four units down. And so, therefore, you know, a shutdown process or protocol will take place, because, you know, you're about to lose your condensers. And so -- and then not only at 3 and 4, but 1 and 2 will be taking actions to make sure that everything is leak tight.

And they say, in reality, this is going to be a multi-hour event before the floods actually start, actually even if they get to the site or to the plant. So, as I say, there are a number of -- and I'm relying on what the 1 and 2 procedures are and the ones we have lived with for a number of years, not only for the main cooling reservoir breach but what we live with every summer, which is hurricanes.

And so the steps that are in there are, like I say, pretty thought out and with respect to what will be happening to the plant and how you will secure the plant, how you ensure doors are closed.

VICE CHAIRMAN BLEY: Okay. All right. Thank you.

MEMBER SCHULTZ: And so that's a verification. The operating procedures are to verify that the doors are closed.

MR. HEAD: Yes, sir. Now, in 1 and 2, right now they will have -- they have some doors that are open. Okay? And they will -- you know, the first thing you do is you either call security and validate with the plant operator or vice versa, but the doors will get closed.

MEMBER CORRADINI: Okay. Just to make sure that I'm not -- I want to just make sure I've got it accurate in my notes. But as it sits, for 3 and 4, they are based on post-Fukushima actions. They will be closed and verified to be closed versus potentially be open and somebody is going to go and close them.

MR. HEAD: Yes, sir.

MEMBER CORRADINI: Okay. Fine.

MR. HEAD: Any other questions on this?

MEMBER BANERJEE: So this is sort of a flood where the level rises. There is no sort of surge and that goes through, a wave.

MR. HEAD: I think it will depend on your perspective. To someone standing there, it might look like --

MEMBER BANERJEE: Well, it will look like -- I'm just wondering whether there is -- you know, often there is a solitary wave that travels along a water body, which is higher than the equilibrium. That doesn't happen here?

MR. HEAD: Because of the flatness, okay, it is going to take a while for the water to get there, and then it's always --

MEMBER BANERJEE: But it doesn't depend on the flatness. It depends on the impulse that drives it.

MR. HEAD: Agreed. But in this case, the impulse is a slowly -- you know, it's a growing impulse.

MEMBER BANERJEE: There is no sudden opening.

MR. HEAD: You're right. Now, 1 and 2, their design basis flood is based on an immediate removal of 2,000 linear feet of the embankment. And so that would be what -- you know, that's what you would -- so this is clearly a more sophisticated analysis than what we did for 1 and 2.

MEMBER SKILLMAN: Scott, let me ask this question.

MR. HEAD: Yes, sir.

MEMBER SKILLMAN: When you described the sequence, it isn't too different than a levee breach, for instance, that we saw in New Orleans during Katrina.

MR. HEAD: I think it's drastically different than a levee breach.

MEMBER SKILLMAN: I'd like to understand why it's different.

MR. HEAD: Okay. This is an engineered embankment that is always full and monitored on a daily basis. Levees quite frequently are generated from the soil at the location, and they quite frequently overtop. And in an overtopping event, a significant amount of the levee can go at one point in time. And because it's not -- and it's also -- levees are challenged by normally a river or something, and so it has a -- it's stressed more than the embankment will be because of the river.

MEMBER CORRADINI: A convective low.

MR. HEAD: And, like I say, because it's -- their levees are normally just sitting there, you really don't know the health of them, and so you can reveal, you know, inadequacies in a levee by the flood itself. So we -- you know, we don't refer to this as a levee, and we think the failure aspects are significantly different than a levee.

MEMBER SKILLMAN: Okay.

MR. HEAD: I'll let you -- please, if you want to come back to that, I --

MEMBER POWERS: But once it fails --

MR. HEAD: Once it fails, then it has to grow. And in this case, I'll say growing -- challenging a compressed clay, you know, soil is going to be a challenge because of the way -- because of the way the clay is, it is in fact going to be a -- we believe a -- actually, I mentioned earlier we think possibly four times larger or four times less than our design basis level, because the clay is not going to deteriorate like a sand embankment or in general like a levee that has been overtop, because once you overtop something you have a lot of different space that you can destroy on the far side of the embankment as opposed to having to grow the breach.

MEMBER BANERJEE: Is this an erosion process of growth, or is it actually some sort of mechanical stresses that cause it?

MR. HEAD: Well, it will be eroding to start, to get to the point where you start chopping off the face of the embankment. And then once you get through and you actually have the first breach into the reservoir, then it's an erosion process as if --

MEMBER BANERJEE: It seems to be primarily an erosion process.

MR. HEAD: I think once it's -- you know, once it has grown to the fact where now water is now going through the breach, you will be eroding the material as you go through.

MEMBER BANERJEE: But you don't break off chunks, I take it.

MR. HEAD: I don't think you will on this. Because of the clay soil, I don't believe you will be breaking off chunks. Now, there is some concrete structures in there and stuff, but I don't believe you will be breaking off many chunks.

MEMBER CORRADINI: Other questions? Keep on going.

MR. HEAD: Okay. Final picture of that. Okay. We were asked to discuss the ABWR extended station blackout capabilities. These will be ultimately the Fukushima actions. There is a SECY that identified our necessary response to the Fukushima events. Four actions apply to new reactors. We briefed the Subcommittee on all of these -- the seismic and flooding reevaluations.

We're going to talk about seismic today, mitigating strategies for design basis events, spent fuel instrumentation, and enhanced emergency plan staffing. As part of our licensing strategy, especially all of us that were involved with incorporating lessons learned from Three Mile Island, we put all of our changes in Appendix One Echo, in the COLA, and then used that as a tool to refer to anything that was applicable. So our Fukushima response is -- instead of scattering our response all over the COLA, it is located in One Echo, and then, like I say, refers to other sections as necessary.

Fukushima Recommendation 2.1 with respect to seismic, as part of the review, was actually blended in with the 2.5 review that had pretty much taken place, but because of Fukushima it was -- it needed to be -- it was completed at the same timeframe.

We completed our probabilistic seismic hazard analysis in 2010. While completing that, we obviously were aware that the CEUS work was taking place, and, you know, we're looking forward to addressing that also. The GMRS was based on a SSHAC Level II approach, and, like I say, that's what the initial results were based on.

NUREG-2115 was issued in December of 2011, and, as I said, we looked for ways to address that. It turned out that, as we'll see in a second, that there was a test site included in that document. And we felt it appropriate to use that test site as a sensitivity analysis for our results. The CEUS -- and I will show you here in a second -- the CEUS had minimum impact on our GMRS that we developed on a site-specific basis, and the conclusions were not changed when later on the new ground motion model was made available. And so our results ended up being acceptable.

Yes, sir.

CHAIRMAN STETKAR: Back up. When you say the site-specific design basis SSE is conservative, you actually have -- you have the DCD --

MR. HEAD: Yes, sir. We'll show that.

CHAIRMAN STETKAR: Okay.

MR. HEAD: I think it's on this one. It is.

So this slide -- it shows what Member Stetkar is talking about. The DCD value is the .3 PGA line. You see the black line, and that's what a number of the buildings at the site will be designed to withstand, and that's for the example of the reactor building and the control building.

When we did our analysis, we came up with the dotted blue line that we talked about back in 2010. So we came up with a dotted blue line, and as a result of that we developed the light blue line there for the site specific SSE.

CHAIRMAN STETKAR: That being the solid -- just for the record, the solid --

MR. HEAD: Solid light blue line. Yes, sir. Thank you.

So I referred to the Houston site. So we -- when we -- the data was available to us --

CHAIRMAN STETKAR: And, Scott, you used the solid blue line for design of your site-specific --

MR. HEAD: Yes, sir. Correct.

CHAIRMAN STETKAR: -- structures.

MR. HEAD: And certain site-specific analysis that we needed.

CHAIRMAN STETKAR: Right. Okay.

MR. HEAD: For example, the ultimate heat sync --

CHAIRMAN STETKAR: Right.

MR. HEAD: -- will be designed to the light blue line.

CHAIRMAN STETKAR: Solid one.

MR. HEAD: Light solid blue line, yes, sir.

CHAIRMAN STETKAR: Thank you.

MEMBER CORRADINI: So can I say it differently just so --

MR. HEAD: Yes, sir. Please.

(Laughter)

MEMBER CORRADINI: So you've come in with the standard design. The standard design and its components are following the black.

MR. HEAD: Yes, sir.

MEMBER CORRADINI: And the site-specific are following the blue.

MR. HEAD: Yes, sir.

MEMBER CORRADINI: Both solid.

MR. HEAD: Yes.

MEMBER CORRADINI: Thank you.

MEMBER BANERJEE: And then what's the dotted?

MR. HEAD: That's the rest of the story. So Houston -- the Houston test site is in the CEUS seismic source document, and it was interesting, we said, "Well, you know, it's 80 miles -- it was 80 miles from Houston. It's closer to New Madrid." And it just -- given the results that were there, we thought it was appropriate to see if that was -- you know, would be a useful sensitivity analysis.

So what we did, we in essence moved the STP soil to the Houston test site and did the implications -- amplifications that are necessary with respect to that. We concluded that the local earthquakes -- the local earthquake regime is the same at Houston as it is at South Texas Project. And being 80 miles closer to New Madrid, which is pretty much the controlling earthquake for us, or is the controlling earthquake for us, we then developed the four red dots there. And that allowed us to conclude, without going the full-blown effort, that in fact our site-specific SSE is conservative and is valid.

Since then, we have also used the new ground motion model and confirmed that the curve goes down more and significantly more in the low frequency range. So the new ground motion model confirmed our -- you know, our conclusions. And we are not presenting that today because we never presented that to the ACRS. That curve was in fact shown to you by the NRC that -- in their studies that in the new ground motion model the curve is below.

So we clearly believe we have a conservative site-specific SSE, and obviously bounded by the DCD SSE.

Any questions on this?

Okay. With respect to Fukushima Recommendation 7.1 on spent fuel pool, okay, it includes a reliable level and temperature monitors. The level and temperature indication will be provided in the main control room via process computer. And the level indication independent of the process computer will be provided in the remote shutdown panel or other suitable location, and that word is normally -- it means that if it’s not actually on the panel, it will be in the room there for the operators to use.

It provides reliable indication. There will be two permanent fixed instrument channels. They will be located on opposite ends of the pool or cater-corner from each other. They will indicate from the top of the fuel racks to above normal operating level, and the instruments will be powered by Class 1E battery. The actual -- you know, the actual -- we have not selected the process that we'll use. We've got a number of good ideas about it, but that will all be ultimately resolved by the closure of an ITAAC that came with this.

Any questions on this?

Okay. With respect to 9.3, the emergency plan, it will ultimately be part of the site-wide plans for Units 1 and 4. We are going to use the NEI guidance to assess the staff and the communication capabilities necessary for a multi-unit -- in this case, you know, ultimately a four-unit capabilities, and that will be based on the detailed procedures. It will be developed and implemented during the operational programs and, as I say, in concert with STP 1 and 2, who will be the operator of all four units.

And this one will be ultimately closed and addressed by a license condition. Okay?

MEMBER BANERJEE: What does that last statement mean?

MR. HEAD: Well, it means that we will have to go through the -- basically, you know, the three steps above, and then demonstrate that we have the capabilities and that we have the timing and the people and the staff to meet the requirements that are included in this, and that we will have -- the NRC will then have to agree to that and close the license condition.

Okay? Any other questions on this one?

Okay. And with respect to 4.2, let's take a second here and point out that this will have a -- basically, two significant parts to this presentation. The first is that we want to talk and make sure that the Committee is aware of the ABWR as enhanced by NINA to address significant issues like a Fukushima-type event, because it -- we believe that the ABWR, especially with respect to extended station blackout, had many, many features that were already -- you know, already in the design.

And then we will have a second aspect of the discussion that will cover the fact that we are -- we are not allowed to consider AC power, and, therefore, the CTG is not considered as part of the -- part of that discussion. So there will -- you will have two different -- we will have two different aspects of the discussion.

MEMBER BANERJEE: That's a gas turbine.

MR. HEAD: Yes.

MEMBER CORRADINI: But not credited.

MR. HEAD: Well, we're crediting it. And they --

MEMBER CORRADINI: I'm sorry. I didn't say that accurately. Staff is not crediting it.

MR. HEAD: Well, it's credited in the DCD, and --

MR. TOMKIN: But not in FLEX.

MR. HEAD: But not in FLEX. That was my -- you know, so the combustion turbine generator we believe is an incredibly important feature. It is diverse from the three diesels that we have. And another very important aspect we believe of this is that, as we'll show later, Evans will make sure that there is a readily available cross-connect to the other units' combustion turbine generator, which is -- I think is an important aspect with respect to contemplating what an extended station blackout would look like at the STP 3 and 4.

MEMBER BANERJEE: So you can't -- you don't credit it because of what reason, the gas comes from --

MR. HEAD: No, no. We don't credit because of the -- the Fukushima recommendation, as ultimately implemented by the NEI guidance, you're not allowed to take credit for AC power, installed AC power. This is AC power, and so --

MEMBER SKILLMAN: It's installed AC power.

MR. HEAD: Yes, sir.

MEMBER SKILLMAN: It's installed AC power.

MEMBER RICCARDELLA: Is it gas or fuel --

MR. HEAD: Fuel oil.

MEMBER BANERJEE: Oh. So it's not a gas turbine.

MR. HEAD: Yes, sir.

MEMBER BANERJEE: So I got it wrong. I thought it was a gas turbine. And could you expand on what you mean by "substantial battery capability"?

MR. HEAD: Yes, sir. I'll -- as soon as I --

MEMBER CORRADINI: This is just the outline. He is on his way.

MR. HEAD: No, this is the speech.

VICE CHAIRMAN BLEY: Scott?

MR. HEAD: Yes, sir.

VICE CHAIRMAN BLEY: Can you remind us how, even though you've installed the capability to cross-connect against the other unit, how you -- are the breakers racked out that can do that? Were not permanently connected across the two units, is that right?

MR. HEAD: They're not racked out. They're installed -- it's installed equipment.

VICE CHAIRMAN BLEY: Okay.

MR. HEAD: Normally open. But it is set up to be -- it will be set up -- I mean, it's -- the breakers are there and it is -- Evans, do you want to --

MR. HEACOCK: Yes. This is Evans Heacock. The design was to have breakers that are installed but normally open. It's going to be controlled operated by procedure.

VICE CHAIRMAN BLEY: Controlled by?

MR. HEACOCK: By procedure to close breakers as necessary.

VICE CHAIRMAN BLEY: Okay. Thanks.

CHAIRMAN STETKAR: Evans, does one gas turbine -- I don't recall, so does one gas turbine have enough capacity to pick up two -- one bus on each unit?

MR. HEACOCK: Yes. The design of the combustion turbine is 20 megawatt.

CHAIRMAN STETKAR: Okay.

MR. HEACOCK: And it --

MEMBER BANERJEE: Basically, kerosene machines or what?

MR. MOOKHOEK: It uses the same fuel that you would run in a diesel.

MEMBER BANERJEE: Oh, okay. So it is not a jet engine.

MR. MOOKHOEK: It's a diesel fuel-fired gas turbine.

MEMBER BANERJEE: It's --

MR. HEACOCK: It's very similar to a turbine, regular gas turbine. But it runs on multiple types of fuel. In this case, we're going to be using diesel.

MEMBER BANERJEE: Okay.

MR. HEAD: You mentioned -- it's 20 megawatts. It's a very large device, and you can actually power it from both -- both units, if necessary.

MEMBER BANERJEE: It can be powered with different fuels, diesel --

MR. HEAD: Yes, sir. But it will be powered with the fuel that's --

MEMBER BANERJEE: Yes. You will be using diesel.

MR. HEAD: Yes.

MEMBER BANERJEE: Okay.

MEMBER REMPE: So how long would they be expected to last if -- and how long would you take credit for, if you could take credit for?

MR. MOOKHOEK: We have enough fuel for seven days.

MEMBER REMPE: Seven days?

MR. HEAD: At maximum load.

MR. MOOKHOEK: At maximum load. Actually, I think it would be longer than that in reality.

MR. HEAD: Okay. Another interesting feature of the certified design was the AC independent water addition system, and that is a diesel-backed -- or diesel fire pump that will be started automatically at a -- on a station blackout. And we'll -- we can provide -- we have one for both units, and it provides, according to the -- provides water to the core after we have depressurized, but it's -- like I say, it's a certified design, and it's, like I say, a very important aspect with respect to the --

MEMBER POWERS: What's the water source on this?

MR. HEAD: The fire, fire tanks, fire water tanks.

Reactor cooling, actuation cooling, this is a Clyde Union pump. It's not a Terry turbine. It is -- you know, it has a mono-block design. It is self-lubricated, and it needs no external sources for support, and so it --

MEMBER CORRADINI: Is that the biggest difference is it's self-cooled, water-cooled bearings?

MR. THOMAS: And it requires no power, no external services whatsoever to operate.

MEMBER CORRADINI: Oh, not even AC for valve control.

MR. THOMAS: It's a mechanically operated governor system.

MEMBER CORRADINI: So somebody would have to be there?

MR. THOMAS: No. All you have to do is open the steam emission valve and open the suction valve and it will run.

MEMBER CORRADINI: Okay. Thank you.

MR. HEAD: Containment overpressure protection system. This is --

MEMBER CORRADINI: Can I ask another question?

MR. HEAD: Sure, please.

MEMBER CORRADINI: Just so where are these installed in current plants now? Or where are they in service? Just generally in the power industry?

MR. HEAD: There is a number of PWRs that they're in right now.

MEMBER CORRADINI: Oh, there are. For the aux feeds.

MR. HEAD: I think in Korea, and there may be some in Europe. And I don't know of a BWR yet that has them. They were -- they're in Lung Min, but obviously not operating. Our PRA guys, you know, we thought we were on the verge of seeing enough information to actually use them in our modeling aspects, but they're out there and they're being --

MR. THOMAS: It's quite a long list. Those were originally in submarine service, and then it was adapted for power plant service. And there is quite a long list. I don't have it.

MEMBER CORRADINI: That's enough. Just a side question. Thank you.

MR. HEAD: So, yes, we have our passive containment overpressure protection system that we really have made no changes to with respect to the -- this Fukushima recommendation.

And then, finally, substantial battery capability. The certified design, and as enhanced a little bit by us, does have substantial battery capability. But for a Fukushima type of situation, it's important that we maintain that and protect that capability. So what you'll see later on is one of the crucial decisions we have to make is to go to the remote shutdown panel and deenergize all the computers, so that we -- we keep that battery capability for an extended period of time to get us basically to Phase 3 and --

MEMBER BANERJEE: So how long would it -- what does that mean in terms of time?

MR. HEAD: Well, 43 hours is -- on Division 1, on one division. Yes, for licensing purposes, when we start talking about FLEX, we only stayed with Division 1. There's three other divisions, and we in One Echo describe how those all can be interconnected. And so we really do have substantially more. But from a licensing perspective, and for us to be able to demonstrate when Phase 3 would start, we're just assuming the use of the one division.

MEMBER BANERJEE: How many megawatt hours or kilowatt hours of capability have you had in --

MR. HEAD: Evans, do you want to go over amp hours?

MEMBER BANERJEE: What voltage is fine?

MR. HEACOCK: The batteries, as designed, are over 5,000 amp hour battery for Div 1. Div 2, 3, and 4 --

MEMBER BANERJEE: What voltage?

MR. HEACOCK: 125.

MEMBER BANERJEE: 125.

MR. HEAD: And we do have another discussion on that later on, because that was an interesting discussion at our last Subcommittee meeting. So we thought we would offer it just for the whole --

MEMBER BANERJEE: But it is substantially enhanced or --

MR. HEAD: No. The one division we're talking about right now is pretty much -- Evans, go into the --

MR. HEACOCK: The certified design, the Division 1 battery was sized to be 4,000 amp hour battery at 125. We actually have increased that a little bit due to the computer -- as we were looking at design, we actually increased the size of the battery before Fukushima actually, go to a 5,000 amp hour battery.

CHAIRMAN STETKAR: The other three divisions are smaller.

MR. HEAD: Yes. The other three divisions are smaller, about -- off the top of my head, they are probably between 3- and 4,000 amp hours, still fairly large, though.

MR. THOMAS: With the cross-connect capability we will describe later, though, we have analyzed it to 72 hours, if I'm not mistaken.

MR. HEACOCK: That's correct. We can change out as go along over time. We have cross-connect between the batteries, and we can make it past 72 hours with three batteries, not even -- Division 4 never gets pulled into it for --

MEMBER BANERJEE: How often do you test these batteries?

MR. HEACOCK: I'm sorry?

MR. HEAD: How often do we test them?

MR. HEACOCK: It's going to be following the standard guidance of 450, IEEE 450. They will do surveillances as required by tech specs. I am not familiar with the number off the top of my head that's typically in -- about five years I think they go through, two to five years. I'd just have to go back and look at the tech specs. I don't know off the top of my head.

MR. HEAD: But there is something you do

every outage, just in terms of not the high-level drainages --

MR. HEACOCK: Right.

MR. HEAD: -- stuff like that, but you -- you know, there are surveillances that you do --

MEMBER BANERJEE: We just reviewed a document where they were looking at the float current as a measure of the battery's health. I don't know if that has entered into the regulatory structure or not. Dennis will know. What's the state of that? Remember, we reviewed this document?

VICE CHAIRMAN BLEY: No. I don't know where we stand on that, except -- I don't know if the reg guide has actually come out yet formally.

MEMBER BANERJEE: Something is in process, though.

VICE CHAIRMAN BLEY: Yes. Yes.

MEMBER SKILLMAN: Scott, let me ask this.

MR. HEAD: Sure, please.

MEMBER SKILLMAN: You identified a manual action to strip the computers to preserve battery life.

MR. HEAD: Which we'll be talking about in more detail in a second.

MEMBER SKILLMAN: Can you get there during the flood?

MR. HEAD: Yes, sir. It’s all inside.

MEMBER SKILLMAN: Thanks.

MR. HEAD: Okay. So let me summarize this, is that, you know, the ABR we believe is designed for station blackout, with or without the CTG. In fact, though, we believe they have expected to -- the power to mitigate events of this type. We have had some additional enhancement to the design in terms of stuff I’ve talked about earlier, but in flood protecting and protecting from missiles for these -- the CTG and the AC independent water addition.

But even without crediting the CTGs, ACIWA, RCIC, and COPS can mitigate an extended loss of AC power, so that’s what we’ll talk about next. And this will have a combination of a number of slides. And in honor of time -- and it will have sort of within it a timeline that will be speaking to some of what we talked about here.

The guidance is based -- or what we have developed is based on industry guidance out of NEI 12-06, and we ultimately concluded that our Phase 1 can be -- is 36 hours in length, and we directly go into Phase 3. There is no Phase 2 required with our plan that we have here.

And the offsite equipment arrives at the staging area within 24 hours, and we expect it to be available and ready to use in 32 hours. So that all aligns with our battery capabilities -- you know, assumptions of our battery capabilities and our water capabilities that we'll show here in a second.

And this is what we know. The design basis external event is a flood caused by a breach of the main cooling reservoir. Even though FLEX assumes, as a premise, that it just happens, as part of our thinking we have at least laid over that some of the site-specific aspects of what might be going on. And so, you know, we thought it was important to not have to have people running around within a Phase 2 environment if we have had a main cooling reservoir breach. So that's kind of some of the thinking that went behind that.

And so as the water level starts receding, we are quite confident that we will be able to get stuff from the base city or wherever the stuff is staged to the site via trucks and other stuff as necessary for the Phase 3 aspect of this.

So what's important with respect to --

MEMBER CORRADINI: Can I ask --

MR. HEAD: Sure.

MEMBER CORRADINI: -- a slightly different question? I thought I had something -- from a training standpoint of this activity, do you train off of the FLEX plan, or do you have alternative plans depending upon availability of onsite equipment? I remember -- I thought I had asked that, and I don't remember the answer.

MR. HEAD: I think we will train and access the capabilities of the entire site. You will not -- you know, if there isn't a flood, for example, and we need some equipment or want some equipment, if something has failed, then we will certainly use that. But I'm going to let my shift supervisor/colleague describe what we do in that case.

MR. MOOKHOEK: That runs, then, through Phase 1, Phase 2, Phase 3. Well, we basically skip Phase 2. We go from installed equipment directly to offsite equipment. So we don't have any staged equipment that we rely on for our site. Unit 1 and 2 does, but --

MEMBER CORRADINI: That was my next question. Thank you.

MR. MOOKHOEK: But we do not.

MR. HEAD: But let me just correct -- I mean, we do have other equipment available to us that we are not using in a -- and this -- for the license of this process with respect to 4.2. We have other pumps. We have backups to ACIWA, for example, that --

MEMBER SCHULTZ: Specifically, for Units 3 and 4.

MR. HEAD: Yes, sir. Yes, sir.

MEMBER SCHULTZ: That's what I was asking. Thank you.

MR. HEAD: What we're talking about here is the minimum available to us to meet this. Okay? And as I was trying to answer your question, when you --

MEMBER SCHULTZ: No, you answered it.

MR. HEAD: -- procedures, you don't -- you know, you ultimately have to keep in mind the worst case. But if you have other options available to you, you certainly want those options built into your procedures. That's something we've learned, you know, some time ago.

MEMBER CORRADINI: Okay. I thought I asked that, but you answered it. Thank you.

MR. HEAD: So the crucial decisions that need to be made is that if -- is a decision on whether we are in -- we are in an extended loss of AC power because we then know that once we've made that decision we are ultimately getting ready to do -- to deenergize the battery -- the computers to save the battery life that we talked about earlier.

And operators are going to be expected to declare an ELAP within 30 minutes. And we've done our battery calculations based on those decisions, and in fact I believe we did the battery calculation based on, you know, starting that deenergization in an hour and a half. So we have margin with respect to how soon that happens.

Within an hour, we're going to relocate to the remote shutdown system. At that point in time, there will be monitoring water level and other -- the specific features, and then we will obviously be monitoring the RCIC flow into the reactor vessel from the remote shutdown panel.

CHAIRMAN STETKAR: Scott, that remote shutdown panel, if I recall, is strictly a hardwired analog set of equipment. Is that correct?

MR. HEAD: Yes, sir.

CHAIRMAN STETKAR: Okay. How often do you expect to train the operators to actually use that stuff? Because they're now relocating to a very, very different environment from the environment that they live in 24 hours --

VICE CHAIRMAN BLEY: And trained --

CHAIRMAN STETKAR: -- and actually use it, not just stand there and stare at it but actually use it.

MR. HEAD: There is where you go with a control room fire. So we are already trained to go use this in a totally different environment, but it's part of the -- it's part of all the training processes, and it's part of periodic, you know, requal that people are understood -- before Fukushima, it was part of going down and making sure all of the transfers took place as part of --

CHAIRMAN STETKAR: Do you actually train the operators to shut down the plant and control it in hot shutdown from that location?

MR. MOOKHOEK: I know in Unit 1 and 2 there is a requirement that we do the walkthroughs.

CHAIRMAN STETKAR: No, no, that's not what I asked.

MR. MOOKHOEK: Not the actual, but the --

CHAIRMAN STETKAR: Oh, okay. So the operators will never be trained to operate the plant from that location.

MR. MOOKHOEK: So we do walkthroughs a minimum of every two years to go through and actually get the switches. But also, in the simulator, the simulator has a model for the remote shutdown system that is in a separate room, and they go actually do it from there. So, no, we do not cycle the physical plant.

CHAIRMAN STETKAR: You don't cycle -- so, for example --

MR. MOOKHOEK: It will be done in startup testing.

CHAIRMAN STETKAR: During shutdown though, for example, if you're coming down for an outage, you don't tell the guys to go out there and, you know --

MR. MOOKHOEK: No, sir.

CHAIRMAN STETKAR: -- exercise or --

VICE CHAIRMAN BLEY: Tell us a little more about the simulator. Is it -- it's a computer mockup, or is it a panel like it's a --

MR. MOOKHOEK: The one at Unit 1 and 2 is a panel. It's --

VICE CHAIRMAN BLEY: And they actually use it as a simulator.

MR. MOOKHOEK: And they actually use it. You actually say --

VICE CHAIRMAN BLEY: Okay. That's good. I didn't know you had that.

MR. TOMKIN: I think every plant in the country has it.

MR. MOOKHOEK: Yes. So we --

CHAIRMAN STETKAR: Well, but a lot of the plants in the country, you go from analog to analog. Here you're going from something that looks like big screens and digital to analog. It's much different from an operator's perspective.

MR. MOOKHOEK: It would be a direct copy of the panels that they would actually be working on.

CHAIRMAN STETKAR: Good.

MR. HEAD: Concurrent with the decision we made to run an ELAP, or at least with respect to when we -- people go to remote shutdown, we're going to perform a load shed to ensure that the Division 1 battery life is greater than 40 hours, and that will involve sending a couple operators out to a number of different places in the plant, procedurally driven, trained upon, and deenergize the buses to ensure that -- well, basically, you know, remove the computers, because they are a substantial load. And then we'll see what that load shed looks like here in a second.

We expect RCIC to be operated manually after the load shed, and with respect to the timeline, you know, we will be requesting the offsite supplies, the Phase 3 supplies, within two hours. I was talking to our emergency operating -- one of our -- one of my colleagues on emergency preparedness over on 1 and 2, and, you know, going through what their training and planning for that would be.

And, you know, for us, with the classic threat we have, which is hurricanes, a lot of that discussion would take place actually before the hurricane ever lands, and they would be making decisions on whether we'd come from Phoenix or Memphis. So it's a -- for a real event or something we expect more likely to occur, such as a hurricane, there would be a lot of discussions that would take place probably even before that two hours.

Suction is switched to the condensate storage tank at about 10 hours. And COPS is expected to actuate and begin cooling in the containment at around 20 hours. And then we talked about in approximately 20 hours the design basis flood is beginning to go below plant grade at 20 hours. So here is our design basis flood again.

We mentioned before offsite equipment is expected to be in the staging area in 26 hours and operational at 32, and then we would expect it to be actually, you know, hooked up in 36 hours. I guess an interesting discussion we had at the Subcommittee meeting is our -- you know, the diesels that we would bring in to do this are 480-volt diesels.

I just want to take a step and clarify that we have done nothing that would exclude bringing in bigger diesels if the STPNC, you know, expected those to be appropriate or necessary. But we felt 480 volt was appropriate for our -- for the work we needed to do here.

When the CST nears completion, which is in greater than 36 hours on the level we have assumed, core cooling would be transitioned to the AC independent water addition system. We started with a CST level that is not at the high point of the tank on many events, or certainly in a hurricane that tank would be completely filled, and in fact this -- that transition could take place much later.

Once Phase 3 equipment is hooked up, ventilation will be restored and smoke purged. Therefore, the batteries will be being charged at that point in time. And then, as we mentioned in the Subcommittee, there will be a carefully thought out and controlled process for restoring loads and transitioning back to command and control back in the main control room. We recognize that would -- after deenergizing all of that, there would be a careful process that we would have to go through.

At that point in time, the operating staff would have a lot of help onsite between, you know, the tech support center and others that would have gathered to help mitigate the situation. And so we would expect procedures and guidance to be built to help us get through that process.

So that is the -- I think -- no, it's not. The battery sizing calculations. We did have an interesting discussion --

MEMBER CORRADINI: We will tell them what happened. Go ahead.

MR. HEAD: Okay. So we did have an interesting discussion regarding battery sizing calculations that Charlie was -- it was based on supplied battery discharge ratings through 72 hours based on IEEE methodology. At the end of our duty cycle that we impose on the batteries for this, the batteries would be at 106.8 volts, and the inverters we will be getting will be operated at 100 volts.

So that was kind of our message from the last meeting that we wanted to summarize, and then we thought we'd show what this load strip looks like. You know, the green is, you know, what the battery --

you know, batteries are seeing in terms of the load until we do the strip, and then, you know, the multi-colored out here are what would be happening to support inverters for the instruments and lighting. This is safe shutdown lighting, so that's what you would be having here.

The spikes are the assumptions that we made if we did actually energize RCIC once -- you know, if we turned it off because the vessel was full or turning it back on once we needed -- when it got to the appropriate level. So that's in -- it's embedded in there as a valve operation.

Yes, sorry.

MEMBER CORRADINI: Okay. Thank you.

MR. HEAD: Just to make sure we had all potential loads --

MEMBER CORRADINI: Understood.

MR. HEAD: -- as part of our calculation.

Okay. So that is --

MEMBER CORRADINI: No. No. There's one -- excuse me.

MR. HEAD: Our summary -- you know, we do main core cooling. RCIC can be used from zero to 36 hours. And ACIWA we assumed would be beyond 36 hours. Containment cooling is via COPS. Spent fuel pool cooling is -- you know, no makeup is needed. We confirmed the less than 36 hours, and then we would use AC independent water addition. There are valve lineups that would allow us to put water in the core. And we believe clearly we have demonstrated we have defense-in-depth with respect to our design.

So any questions on that discussion with respect to Fukushima?

CHAIRMAN STETKAR: Just ACIWA is above the 40-foot level?

MR. HEAD: No, sir.

CHAIRMAN STETKAR: It is not.

MR. HEAD: No, but it is part of our enhancements that we reflect in One Echo is we've made it flood protected.

CHAIRMAN STETKAR: Okay.

MR. HEAD: It was in a robust structure --

CHAIRMAN STETKAR: Yes, I --

MR. HEAD: -- as part of the DCD, and we've made it --

CHAIRMAN STETKAR: I thought I recalled it was out in the yard there somewhere.

MR. HEAD: Yes, sir. It's out in the -- close to the fire tanks.

Yes, sir?

MEMBER SCHULTZ: The AC addition, independent water addition, I got confused. Is that one system for both units?

MR. HEAD: Yes, sir. It's one system for both units.

MEMBER SCHULTZ: For both units. Thank you.

CHAIRMAN STETKAR: We confirmed I think during the Subcommittee meeting that the pump has enough capacity to supply both units simultaneously.

MR. HEAD: We clarified not -- not initially. You know, it takes a few moments before, you know, initial decay heat, but after 36 hours it has --

MEMBER SCHULTZ: Yes. When it was said that both units have one system, I was --

MR. HEAD: I'm sorry. I --

MEMBER SCHULTZ: -- I thought you might have added one.

MR. HEAD: Okay. So we want to move on to the Bulletin, the open phase issue. And before I go into this, I will just -- I will say, when we were having discussions with the staff, in our timeframe with respect to licensing, I'm sure all of you all recognize that the industry is -- the operating fleet is working through their issues and trying to define the approach that they were going to take. And we were in parallel to that, and we were somewhat leading that.

And so in our interactions with the staff they said, “Okay. For you to meet our expectations for what hasn’t been really completed with respect to the operating fleet. We need you to detect the open phase condition. We need you to alarm in the control room. We need you to actuate, and then we need you to put the equipment in tech specs.”

And as we looked at that expectation, what we concluded is that the -- well, first of all we concluded, well, what is -- what are we really trying to do here? And the fundamental goal here is to protect the motors that are -- the ECCS and other motors that are necessary that could be damaged if you have a condition, an open phase condition.

And so what we came up with is in fact two systems, you know, one system to detect out in the switchyard and another system to protect the safety-related pumps or motors by detecting a negative sequence -- negative phase sequence. So we’ll go into it in a lot more detail.

So the first system is -- will detect the open phase. It will be located out in the switchyard on the high side of the main transformers. We have not chosen what the system will be at this point in time. I know that the ACRS Committee has -- you all have seen different, you know, descriptions of what is out there. And so that is now in ITAAC with functional expectations as to what the system will be capable of doing to detect and alarm the open phase condition.

VICE CHAIRMAN BLEY: You haven't changed anything since our Subcommittee meeting.

MR. HEAD: No, sir.

CHAIRMAN STETKAR: And just for the record, the ACRS has looked at what the industry is proposing and what the staff is reviewing in regards to protection for operating plants. And we have actually written a letter on that, I think in December, was it?

VICE CHAIRMAN BLEY: Roughly. Approximately.

CHAIRMAN STETKAR: So we're familiar with --

MR. HEAD: And so the second system was to protect the motors and to get the automatic actuation and to put that equipment coverage by tech specs. And that equipment is negative sequence voltage relays that are located on each 4160 bus. There will be three of them, and if a negative sequence occurs that would threaten the motors, then it would open the breakers and ultimately we would -- we would then -- you know, the under voltage relays would detect that, and the emergency diesel would pick up the bus. And those relays are in tech specs and just treated like any other relays with respect to their surveillances and the testing program.

So we showed this picture last time, but what we -- we didn't have the two systems on the picture, so we thought we would enhance this. You see the first system I talked about, open phase detection, that will be associated with each -- yes, sir.

CHAIRMAN STETKAR: Scott, the relays you said are in tech specs are the relays at the safety buses, not the --

MR. HEAD: Yes, sir.

CHAIRMAN STETKAR: -- not the detection relays out on --

MR. HEAD: That's our goal.

CHAIRMAN STETKAR: This for clarification.

MR. HEAD: This is the open phase detection, Item Number 1 on that, that we have not chosen yet, but there is obviously industry solutions out there that would be located on each transformer that would detect and alarm that the open phase condition has occurred.

The negative phase sequence relays, three on each 4160 bus, which basically will I think look like an undervoltage relay, any other relays that are located on the bus, if they detect a negative phase that has a set point and a timing associated with it, then they will open the breakers and the diesel will pick up the load. And there is -- there were three on each 4160 bus.

We don’t know -- there is no relays. This will all be pretty much -- I mean, there is no relay associated with the open phase detection.

VICE CHAIRMAN BLEY: Everything is on the emergency buses. So if you detect negative sequence there, you open the supplies and the diesels start.

MR. HEAD: Yes, sir. For any reason. There are certain scenarios where, depending on the -- depending on -- if we were in an outage or something and the loading was right, that you might get this alarm, but the negative phase sequence is not sufficient enough to challenge the motors that you won’t strip the bus.

MEMBER BALLINGER: You have said that before. We talked about that in the meeting.

MR. HEAD: So that is our solution to the open phase. And I wanted to note that there was another question regarding the location of the ISO phase. And that is the blue, is the ISO phase bus, and green is power cable.

VICE CHAIRMAN BLEY: And, therefore, you are not proposing open phase identification on the blue.

MR. HEAD: Yes, sir. We are not proposing that.

VICE CHAIRMAN BLEY: Fair enough.

MR. HEAD: And given the protection we have down here, it’s -- we will -- when the diesel starts and the operator sees the alarm, it will be pretty clear something has happened here.

MR. MOOKHOEK: We expect also to get an alarm -- if any of those relays actuate and cause an actuation, besides the diesel starting, you will get alarms in the control room to tell you why.

MR. HEAD: Right.

VICE CHAIRMAN BLEY: And those will be clear, that it was a negative sequence.

MR. MOOKHOEK: Yes.

VICE CHAIRMAN BLEY: Okay.

MEMBER SKILLMAN: Let me ask this.

VICE CHAIRMAN BLEY: Not a trouble alarm or --

MEMBER SKILLMAN: Based on the information we have, what you are doing here is driven in part by your ETAP analysis.

MR. HEAD: Yes, sir.

MEMBER SKILLMAN: And ETAP is a complicated program. It needs to be operated by people who fully understand how that software functions. What confidence do you have that your model is accurate, at least sufficiently accurate so that your protection is what you intend it to be?

MR. HEAD: Steve, do you want to go ahead and get the first shot?

MR. THOMAS: Well, I would say we did a number of ETAP models on this before we came up with this solution. And many of the models indicate that for a loss of phase we would have other protective features available without these relays. These relays will function really without benefit of insight from the ETAP models. The relay is there to protect the motors.

If it sees a condition, from whatever

cause, in the distribution system -- could be a transformer fault, open phase, short, whatever might create that condition on the bus -- it's going to protect the equipment on that bus by stripping the bus and starting the diesels. That's really independent of the ETAP analysis that we performed to look for other possible solutions to this event.

So I would say this solution, even though we had a lot of insight from our ETAP analysis as to what types of options might be available to us, we chose this one because it's really independent of what the system is doing in any of those models.

MR. THOMAS: We are choosing those set points to protect the motors.

MEMBER SKILLMAN: Thank you.

MR. THOMAS: But we did run -- we did have other confirmatory analysis from a different program to validate all of the work that we were doing here, so it wasn't just ETAP. We did have some other --

MEMBER SKILLMAN: Thank you.

MR. HEAD: So comments or questions with respect to all of this?

Okay. So we want to talk about fire-induced spurious signals. And before I go through this drawing, our desired outcome, or at least one significant desired outcome, is to reanswer a question that we got asked in the Subcommittee meeting that we thought was important with respect to the remote digital logic controllers, whether they are in the same room as the switchgear, which is located basically symbolically here.

And the answer is yes, they are all located in the same room as the switchgear, and so that plays into some of our conclusions I think with respect to spurious actuations that are basically addressed by the NEI guidance. And so that's one of the desired outcomes of this discussion.

The other one, there is another picture to show a little more detail with respect to the control room. And so this is a schematic that we have added some detail to. On the left side, you have the instrumentation that goes through a certain level of processing, and then fiber optically the signal is transmitted to the control room.

In the control, it's a computer-based digital, you know, processing that takes place. And ultimately conditions could exist that signals are needed to be generated that -- to initiate some sort of action, any number of different actions, obviously, that are considered.

The safety license -- excuse me, the system logic function, CPUs and other stuff that are located in here, will submit two signals, two independent signals to the remote digital logic function cabinet. After that is received by this other, in essence, computer, hardwire signals are sent on further to complete the initiation of opening breakers, closing breakers, or whatever else needs to occur.

The issue that was discussed at the Subcommittee meeting was the generation of spurious signals. The NEI guidance is really based on copper wires being crossed, and with wires being crossed what signals could be -- or what spurious actuations could occur.

And the focus of the discussion from our perspective is that based on the way these signals are generated and encapsulated and the protocols that are provided as they go out to the remote digital logic controller, and the fact that there are two redundant signals being sent out, the certified design does not consider spurious actuations being generated from the control room.

And, like I say, that was, you know, a significant portion of the discussion we had with respect to that. And so one of the crucial aspects that came out of this, though, is that from a divisional standpoint, all of the spurious actuations that could happen are all located in the same location, with the remote digital logic controller.

So I don't think I finished my story. These signals that are generated from the control room, the digital equipment in the control room, the protocol and the information that is received has to be accepted by the remote digital logic controller as being valid before it will then react to whatever the signal is. And it's important to know that that processing is going on continuous. It is validating that the interactions are taking place, that the signals that are being generated aren't decaying, aren't being deteriorated by some mechanism whether -- you know, where there is much more significant potential for deterioration from electromagnetic issues or spikes or other things.

And so at some point in time the equipment will say, "Wait a minute, whatever I'm getting from this equipment is no longer valid" and will take the appropriate action needed to alarm or to shut itself down. So that, I believe, was the gist of the discussion, at least from our perspective, with respect to what the certified design does not consider spurious actuations being generated from here out to this equipment.

And then, clearly, this equipment is all located in one fire area, or in this case one room, and, therefore, the NEI guidance on how to assess that is appropriate and is what we have committed to use.

MEMBER CORRADINI: Questions?

MR. HEAD: Okay. Next picture. There was a -- we did have a discussion, wanted to make sure that the picture we had wasn't quite as I guess maybe revealing. This is the control room. This is the fire area for the control room. Here you see the panels where the operators sit. Separate room over here is Room 495, and it's where Division 2 and 4 are located. And over here is 497; it's where Division 1 and 3 are located.

We have four -- and this -- we have four instrumentation divisions, but we only have three actuation divisions. So Division, you know, 4 here is really only instrumentation. There is no fourth division of actuation, but all of the computer signal is -- you know, processing takes place in here, and, you know, the -- there is digital cabling under the floors that go back between the control room where the operators are and then out into the -- from there out into the plant.

So I don't -- like I say, we presented this drawing last time and wanted to give a little more clarity to how it was set up and what was in each division or each room. But, again, those rooms are all in the same fire area.

MEMBER BROWN: Okay. Confirm for me, I guess -- I thought the red and the blue outlines were fire areas and isolated from the main -- they're not.

MR. HEAD: No, sir, they are not.

MEMBER BROWN: Okay. I guess I lost that one a little bit. Thank you.

MR. HEAD: I mean, the floor is -- it's a raised floor primarily.

MEMBER BROWN: It's a raised floor, so you have passage from one to the other. Okay.

MR. HEAD: Okay.

MEMBER BROWN: So a fire pretty much takes the whole control room out, and that's the way you --

MR. HEAD: That's the assumption.

MEMBER BROWN: All right. Thank you.

MR. HEAD: But as -- we were also talking at the time about heating and other things, or a smaller fire or something that would be happening over here that would allow other actions to be at least taking place for a certain period of time, and we wanted to show that, you know, there is some distance between them in reality.

CHAIRMAN STETKAR: Okay. The fire hazards analysis, though, is done on a fire area by fire area basis.

MR. HEAD: Yes, sir.

CHAIRMAN STETKAR: Thank you.

MR. HEAD: Now, this is all just part of the discussion in terms of margin and what operators would do.

VICE CHAIRMAN BLEY: You pointed out the two rooms, and --

MR. HEAD: Yes, sir.

VICE CHAIRMAN BLEY: -- somehow the discussion slipped by me. Is the whole area one fire area?

MR. HEAD: Yes, sir.

VICE CHAIRMAN BLEY: Okay. So you would lose both --

MR. MOOKHOEK: That is one fire area.

VICE CHAIRMAN BLEY: Okay.

MR. HEAD: The big wall here is one fire area.

VICE CHAIRMAN BLEY: Okay. But given the layout, if we really had a fire going in there, you would get stuff maybe in one of these instrument rooms first, and then sometime later, we think it would happen in the other.

MR. HEAD: Yes, sir. And, you know, operators would take appropriate action depending on what it was, and then and/or declare --

VICE CHAIRMAN BLEY: But when you go to the alternate shutdown area, it disconnects all of this stuff here.

MR. HEAD: Yes, sir.

MR. THOMAS: Certified design requirement -- there's Divisions 2 and 4 and 1 and 3 -- be electrically and physically separated. This is how it's accomplished in the certified design.

VICE CHAIRMAN BLEY: I thought that was all one fire. Okay.

MEMBER CORRADINI: Other questions?

Okay. Why don't -- we're a bit behind, not to worry about time, but just a little bit. So I'll excuse you all and have the staff come up and hear their analysis and discussion.

MR. HEAD: Thank you, gentlemen.

MEMBER CORRADINI: Thank you.

MR. TAI: Good morning. My name is Tom Tai again, and we walked through the staff review of all issues that STP presented to you earlier.

The first topic we're going to talk about, the design basis flood and seismic. This lists all the tech staff folks that have been involved in the review. The design basis flood, both the applicant and staff considered different type of flood mechanism, including rain, hurricane, and all the other natural phenomena.

And from the pictures that you saw a little while ago it is pretty obvious the MCR, or the main cooling reservoir, is the basis for the flood. And all of the evaluation we did is in the SER Section 2.4.

The main cooling reservoir was put into place for Units 1 and 2 back about 30 years ago, and I don't want to go through all the details, but I think what is important to know is the original design for the MCR was at about 47 feet for two units. Because they are adding two more units to it, so they increased that to about 49. So that was the basis of the evaluation, the design basis. So based on what STP told us, after 40 years, that they did a review at 30 years. They didn't really see any degradation of the structure.

Next slide, please.

As you were saying, for 40-year operation, the basis is at 49 feet. But for the analysis they put it at 50.9, which is almost two feet of margin. And the peak level, based on the analysis, is 30.8 and we rounded it up to 40. So for the purpose of licensing, 40 feet becomes the design basis flood level when the site is sitting at 34.

Next slide, please.

So that is the evaluation for design basis flood. Are there any questions?

Okay. Let's move on to seismic. In the FSAR for 2.5, the ground motion response spectra was based on the EPRI seismic owner's group and the seismic source model and the EPRI ground motion model. And that was what we did at the time to evaluate.

When the CEUS SSC model came out in 2011, we asked the applicant or applicants and all licensees to evaluate impacts on the site GMRS. And as STP explained, they used the Houston site to compare and decided that the site-specific SSC -- both CEUS and the EPRI model.

And the confirm analysis -- I think we did a separate and independent -- separate presentation to the Subcommittee on seismic hazard back in October I think, right? So the existing GMRS is not going to be revised, and we accept that.

Next slide, please.

That's all we have for seismic. Any questions?

MEMBER CORRADINI: Go ahead.

MR. TAI: Fukushima. This slide basically says that a lot of people got involved in this review, because it involves everybody upstairs. And the four recommendations -- 2.1, 4.2. 7.1, 9.3 -- just as we presented earlier. So 2.1 -- next slide, please.

The review -- it's a review of all the external hazards in the existing SER to fiber seismic, 2.4, and wind is 2.3S, and all the operating systems, and it's in Chapter 7, 8, 9, and 5. And procedure is in Chapter 13 and Part 5.

Recommendation -- 2.1 seismic and flooding hazard, STP followed the current guidance and everything is documented in Chapter 2. And, as we said earlier, staff did a sensitivity -- or a confirmative study and took care of that.

4.2 -- the order addresses how they take care of core cooling, containment, and spent fuel pool cooling. And of course they all have to follow the phased approach, one, two, and three, and we follow our ISG to do the evaluation for all the external hazards, and the equipment protections and capability and program control.

As STP said earlier, based on the installed equipment that they have, the Phase 1 lasts 36 hours, and then go to Phase 2. So rely on RCIC and the ACIWA system and COPS for containment protection. And, of course, the manual action, the low shed, they are good for 36 hours.

For Phase 3, they have equipment in less than 36 hours, and there is plenty of water, because they use water from the fire storage tank and plenty of fuel oil. There are three emergency fuel oil storage tanks that -- for what we need to do on the AC independent water system pump that’s fuel oil abatable.

And to make sure that they do all the stuff that they are supposed to do, including the program control, there is license conditions to make sure that everything is in accordance with what would be acceptable.

MEMBER SCHULTZ: Tom, I understand that what I would call the deterministic evaluation or the licensing evaluation that indicates that we go right from Phase 1 to Phase 3, in terms of the timing, that's assuming Phase 3 in fact works.

MR. TAI: Right.

MEMBER SCHULTZ: And it just bothers me that we say Phase 2 is not necessary, because that equipment -- portable equipment that the licensee has indicated they have got equipment and connections that could be used -- could be used, if in fact the Phase 3 equipment does not come onsite 24 hours, so is the license condition going to address -- and you call it an overall integrated plan. Is that going to also address the capabilities that are available outside of the installed equipment and the equipment coming from onsite?

MR. TAI: I think the Phase 2 is not necessarily needed, can be interpreted both negatively and positively.

MEMBER SCHULTZ: You know, I don't want it to turn out to be a negative.

MR. TAI: Right.

MEMBER SCHULTZ: And that's --

MR. TAI: I understand. But I think what we are --

MEMBER SCHULTZ: I'm looking for the license condition to assure that that doesn't happen.

MR. TAI: A lot of the onsite equipment is already onsite, like the fire pump. I think that at least covers the pumps, and generally they are already in the -- a Class 1 building. I believe in the fuel oil transfer tunnel.

So what we are relying on is if you can demonstrate that using onsite equipment that you have installed, which mainly is RCIC and the AC pump and COPS, and the installed water storage tanks, you can last -- you can run that plant safely until you can turn on the offsite equipment, if you need to. And that's what we are saying, that the Phase 2 is not necessary. But Phase 3, I think you're correct. Phase 3 is ready even before that, and that's just --

MEMBER SCHULTZ: If the equipment arrives. But one can come up with an external event description that doesn't allow it to get there, and there are -- is Phase 2 equipment that is available and should be part of the overall programmatic -- integrated plan, I would think.

MR. TAI: Some of the offsite equipment or underinstalled equipment or non-installed equipment are already onsite.

MR. HEAD: So, Tom, could I add here? We reviewed it -- not having to -- or not having Phase 2 as a positive because it's installed equipment. One Echo discusses all of the other equipment that is available to us that would be used if other situations arise. So all of that is included in all of these other pumps, other aspects of what we could do.

But with respect to this disclosure in the license condition, I would expect it to be limited to what is actually covered here. And that is what I was alluding to earlier. I think procedures will ultimately take advantage of everything that is available to us. But the license condition I think is more or less specific to this.

MEMBER CORRADINI: So can I say it differently, just so I understand?

MR. HEAD: Yes, sir.

MEMBER CORRADINI: So the staff is okay with this and views it as a positive without the need for Phase 2. But yet the licensee is going to train with all eventualities. That's what I heard when they were up here. So has the staff looked at that training, or is that not within your purview to look at that training, that you may not need Phase 3, or you may choose to use onsite equipment that is portable, et cetera. That's what I'm -- kind of that's where I sense Steve is going. Maybe I'm misinterpreting Steve.

MEMBER SCHULTZ: No. That's where I'm going.

MR. HEAD: As part of our operational programs, closure for operational programs, we would think all of these procedures would be looked at, even those that are -- may not even be covered by the license condition.

MEMBER CORRADINI: Good.

CHAIRMAN STETKAR: And I don't know this, is the portable equipment -- and I know what the portable equipment is, because it is documented in the FSAR. Is that included in your reliability assurance program?

MR. HEAD: Yes.

CHAIRMAN STETKAR: It is?

MR. MOOKHOEK: Ours is. The --

CHAIRMAN STETKAR: Come up, Bill, because you have to identify yourself for the record.

MR. MOOKHOEK: Bill Mookhoek. Yes. The equipment that we have that is stored onsite in the safety Class 1 buildings, it is part of the reliability assurance program.

CHAIRMAN STETKAR: Thank you.

MR. MOOKHOEK: The offsite equipment from the safe routine is not.

CHAIRMAN STETKAR: I was just interested in the stuff that you would be using during Phase 2 if ACIWA, for example, didn't work.

MR. MOOKHOEK: Yes.

CHAIRMAN STETKAR: And that's part of your reliability --

MR. MOOKHOEK: We will be maintaining that equipment.

CHAIRMAN STETKAR: Thank you.

MEMBER SCHULTZ: I appreciate that. Thank you very much.

MR. TAI: Let's move on to the next slide. Recommendation 7.1, spent fuel pool instrumentation, again, the order required the applicant to provide a reliable level of instrumentation.

STP did some design changes to the spent fuel level instrumentation, so now they have a backup AC power supply and demonstrates separations and redundancy. So what we have now is a ITAAC, a site-specific ITAAC. They make sure that the as-built versus the design is what we find in the spent fuel pool. And it meets the Order 12-051, so we're okay with that.

Any questions on spent fuel pool?

Recommendation 9.3, emergency preparedness. Obviously, these are part of the operating program that they have, so our order requires them to show that they have staffing and communication capabilities. And, again, what we have now is going to be a license condition to take care of all of these programs. And that will be part of Chapter 13, and we are satisfied with that also.

Any questions on this issue?

MEMBER CORRADINI: Questions?

MR. TAI: Okay. Bulletin -- this is based on the Byron 2 event, because of a loss of failure on the non-safety offsite power that it could jeopardize safety, equipment. So for all active plants, what they are required to do is very simple -- detect, alarm, actuate, and tech spec.

Next slide, please.

And STP satisfied those conditions by installing the relay for detection and alarming the control room, and the Class 1E negative sequence relay to identify open phase. It happens. They opened the breaker and let the undervoltage relay turn on the emergency diesel and load all the ECCS equipment.

We will have an ITAAC again in 30-29 to make sure that these conditions can be checked and alarmed. And there will be a tech spec to make sure it's there and the other program will -- it will be part of the programs, because it's Class 1E.

Next slide, please.

And as was discussed earlier, and during the Subcommittee meeting, there is an ISO phase bus for the unit transformer, so the -- another -- that's an existing design, and it's not part of the Bulletin design. So training, as STP alluded to earlier, and test procedures will be in place later.

Any questions?

MEMBER CORRADINI: We may have one or two questions.

MR. TAI: That's it? Let's move on to fire. A long, long time ago, that's like four years ago, four and a half years ago, this question came up about, what is the effect of fire on digital I&C cabinets? And about a month ago we presented to you and gave you the assurance that we think we are okay. We feel comfortable enough that it is okay.

And part of the -- the basis of that decision is what they have done. They committed to NEI 00-01 Rev 2 guidance to do the spurious signal evaluations, and this industry guidance has been endorsed by the NRC, and also Reg Guide 1.189 Rev 2.

CHAIRMAN STETKAR: Does that guidance require you to examine spurious signals in any electronic cabinet? That’s a yes --

MR. TAI: No.

CHAIRMAN STETKAR: No. Okay. Thank you. Continue. I wanted that on the record. It does not.

MR. TAI: That’s correct.

CHAIRMAN STETKAR: Go on.

MR. TAI: And there is -- the safety divisions are separated, and they are independent. And as you saw on the figure a little while ago, the safe shutdown cabinets and the -- and the switchgear and, again, the DTF and SLF have separation also, physically separated, and the robust capability of the I&C architecture, diversity, redundance, voltage logic, and all that kind of stuff. So we feel comfortable enough that we are okay with that.

CHAIRMAN STETKAR: Why?

MR. TAI: I’m going to ask our I&C folks and fire protection folks to elaborate on this. Dennis?

MR. ANDRUKAT: This is Dennis Andrukat, NRO Fire Protection. I’m sorry. Can you repeat the question?

CHAIRMAN STETKAR: Why do you feel

comfortable with the approach outlined on the board there of not looking at spurious signals from fires or heat that affect digital I&C cabinets in particular? I don't care about the cables.

MR. ANDRUKAT: So for the digital equipment, especially -- so most of the digital equipment that we care about for safe shutdown is going to be located in the control room complex, right, like we talked about at the last Subcommittee meeting.

In the -- I'd like to see that picture of this. We talked about the DTFs and the SLFs. Those are all in the control room. We talked about the physical separation of these divisions within the control room. I know we had the discussion that this is a single fire area. Although this is a single fire area, there is physical separation in the control room.

And in control room fire, we have two different types of scenarios that I'd like to look at. The main credit scenario for any fire in the control room, you do an abandonment with the transfer switch which would isolate everything inside the control room, which would include your digital equipment.

Outside of that, if you had a smaller fire that you did not evacuate with, there are other mechanisms the operators can take, not unlike if you had a hardwired traditional analog control room.

CHAIRMAN STETKAR: And how is the staff confident that those other mechanisms that the operators can take can address the spurious signals from a fire in either of those -- what's on the screen now as Room 495 or 497?

MR. ANDRUKAT: So if you had this -- for example, 495, you have two divisions in that area.

CHAIRMAN STETKAR: So that -- so spurious, for example, from my perspective, spurious actuations in 495 can fire off any combination of stuff in the plant, because I can get two out of the three divisions effective there. Right? Say yes.

MR. ANDRUKAT: Okay. I'm listening.

CHAIRMAN STETKAR: Okay. I think -- so if I have a fire in there and I fire off spurious signals for any combination of all systems in the plant, how do I have assurance that the operators can take effective actions, which is what you said, to mitigate that?

MR. ANDRUKAT: Well, the first thing that we have -- we would still have your third train available.

CHAIRMAN STETKAR: No, not -- you're still thinking about a clean fire that does not have any signals. I'm talking about a fire that generates a large number of spurious signals, so you have valves opening and things starting and things stopping and valves closing and all of those things. It's not a clean fire; it's a dirty fire.

MR. ANDRUKAT: I don't see this as necessarily that different than an analog control fire.

CHAIRMAN STETKAR: No, it isn't. That's my question. But why is that -- if I have analog -- if that room contained copper cables and analog signal cabinets, NEI 00-01, because it contains copper cables would say I need to look at spurious signals there, because NEI 00-01 is focused on spurious signals from shorts in cabling, right?

MR. ANDRUKAT: Correct.

CHAIRMAN STETKAR: Okay. But this particular room doesn't contain those copper cables. It does contain those cabinets.

MR. ANDRUKAT: Correct.

CHAIRMAN STETKAR: So now I don't have to consider those spurious signals because miraculously the fiber optic cables are not copper cables and it's not covered in NEI 00-01, so I don't need to think about the cabinets apparently. My question is: suppose I get a bunch of spurious signals from those cabinets, sending out signals through intact -- intact fiber optic cables, causing things to operate in ways that I haven't thought about? How do I have confidence that the operators can mitigate that? Not knowing what's operating or what -- the timing of what is happening in the plant, because I haven't looked at it. I'm not saying that they won't be able to. I'm just saying that nobody has looked at it.

MR. DIAZ: This is Antonio Diaz from NRO. My understanding is, even if this was not a fully developed fire, I understand if it was inside a certain cabinet, equipment cabinet, there are temperature monitors that would cause alarms to go off. I also imagine if there is a fire, a high energy fire monitors, again, would be notifying the operators that there is something going wrong and they would probably take action based on this information.

CHAIRMAN STETKAR: I could say the same things if those were analog signal cabinets with copper wires, could I not?

MR. ANDRUKAT: Correct. But for a control room fire, we have a special situation. It's not going to be like any other room. One of the things with being continuously manned, and with the fire detection that we have in that room, we have an assurance that you're not going to get a large fire. Even if you had a -- so you're going to stay within the cabinet, you may be able to stay within a couple of cabinets. So even with that, you may have some spurious signals, maybe. However, we still like some of the digital --

VICE CHAIRMAN BLEY: Let me ask John's question in a different way, and that is if those were analog cabinets, and it was copper, all the things you just said are true. Would you give them a pass? You wouldn't have to do what it requires in the guidance? Because it is the same thing; it's in the control room.

MR. ANDRUKAT: Correct. So the first thing in the control room that we give credit for are in our upper tier guidance, Reg Guide 1.189, is the transfer switch for all control room fires. NEI guidance talks about -- and I'm not the most familiar with this guidance as to safe shutdown, but I understand there is an Appendix D that deals specifically with control room fires. And I understand it's a slightly different situation than any other portion of the plant. And I'll just --

MEMBER CORRADINI: I'm kind of deferring to John and Dennis about this, because I just don't have the technical background. But the logic you just presented leads me to say that the staff would -- if this was all copper wire, would essentially approve this as designed, fiber optic or no fiber optic. Is that true? That's what I think Dennis is asking. Am I missing something?

MR. ANDRUKAT: Correct.

CHAIRMAN STETKAR: Approve the fact that they have not looked at multiple spurious signals from fires in that area. If this fire area contained analog signal cabinets and only copper wire, would the staff approve the fire hazards analysis that does not look at multiple spurious signals from fires in this area, under Reg Guide 1.189? Would you, yes or no?

MR. ANDRUKAT: We would follow the NEI 00-01 guidance for this.

CHAIRMAN STETKAR: But NEI 00-01 guidance says that I need to look at spurious signals, doesn't it, for fires that affect copper cables?

MR. ANDRUKAT: Correct.

CHAIRMAN STETKAR: Okay.

MR. ANDRUKAT: I would like to add that,

you know, especially for like the groups -- look at Divisions 2 and 4, for instance, right? All of those divisions go to a single switchgear room, but divisionally a switchgear room with RDLCs. The NEI 00-01 guidance for those RDLCs, because RDLCs have a hardwire output to them and a digital input to them, would cover, if you will, all of those spurious actuations, even translated back to the control room.

MEMBER CORRADINI: I mean, if I might just interject, since they are going to ask you a technical question, I am just -- the argument you just presented is what I remember to be the same argument of the Subcommittee. But that doesn't say it can't happen. You're just telling us that the probability of it happening is low. That's what I hear you saying to me.

CHAIRMAN STETKAR: What he didn't say is those are divisionalized switchgear rooms, so the RDLC for the Division 1 switchgear room, I got it. But a fire in -- go back to the former slide, a fire in 497 will fire off -- could fire off spurious signals for all three divisions, because you can make up two out of three logic. And that would not be covered by spurious signals in the division -- only the Division 1 switchgear room.

MR. HEAD: Mr. Chairman, can I offer at least a 1 and 2 perspective with respect to what you're talking about?

CHAIRMAN STETKAR: Sure.

MR. HEAD: Unit 1 and 2, which is copper, before the operators go to the remote shutdown panel, they have to initiate a number of actions -- reactor trip, main steam line actuation -- a number of things to defeat the significant spuriouses that might happen in a control room because we recognize that all the copper has to come together in the control room in 1 and 2.

So the NEI guidance would say go do all of those where it's appropriate. Then go do all the transferring. And so you've done the significant manual -- you've done the significant actions that you need in the control room in a copper plant.

With respect to 3 and 4, we just fundamentally disagree with the premise that these spurious actuations will occur, because a certified design for not only us but for other plants says they do not have to be considered because they are -- it's not magic. It's designed in the way the signals are generated and received. It is an upgrade from a fire protection standpoint that this control room is in fact, we believe, significantly better off than a copper control room like 1 and 2 from a signal standpoint.

MEMBER BROWN: That is fundamentally because you don't have copper from the cabinets into the -- that can degrade under the fire conditions.

MR. HEAD: No copper and --

MEMBER BROWN: All we've done is move it back into 10 maybe, because of the fiber optic cables.

MR. HEAD: Yes. The analysis out in the switchgear room for 3 and 4 will look a whole lot like 1 and 2's analysis because of copper. We think we've enhanced the probabilities of having no spurious actuations from 3 and 4 control room because of the digital architecture in the way the signals are created and received and protected from any degradation, whether it's fire or anything else.

MEMBER BROWN: Are the circuit cards, computer board, and that type of stuff conformally coated? Or are they non-conformally coated circuited cards? Well, I'm asking the question because if you have a fire in these systems, typically if it's internal, it's the byproducts from that smoldering whatever it is that contaminate the cards and can create shorts on the cards, which generate false signals going into whatever it is, which then have a nice, clean path going out.

That's -- I mean, it's just another source of multiple signals. I only ask it from the standpoint if they're coated, there's a time which they will withstand some of that before the degrade.

MR. HEAD: Yes, sir.

MEMBER BROWN: If they're not, then they don't. That's the only reason I'm asking this. I mean, I'm not trying to say yes, no, or indifferent on the whole thing. I'm just saying it's a more -- people are saying --

MEMBER CORRADINI: You're saying that's the mechanism that would cause the degradation.

MEMBER BROWN: It could, yes. If they're not coated. I'm just looking for, how could it happen to make it sort of like we're just not pulling stuff out of the ether, which we're not. I mean, I've had direct experience in some of my equipment where it has been contaminated like that, and because it ended up with a little ground inside on part of the input to the thing, all of a sudden I'm getting all kinds of crap out and everything else is okay. And it can do it across multiple platforms -- I mean, you know, multiple cards if you're in this -- in that one space.

MR. HEAD: Yes, sir. We recognize that that in fact could occur, that the computer -- the computers inside the control room could generate something going out to the fields of the remote digital logic controller. But unless it’s the right signal with the right protocol, the right fundamental way the data is encapsulated, it will not be received and acted upon. It has to be encapsulated and created in a manner that it is a valid signal or it will be rejected.

MEMBER BROWN: I understand your point relative to the receipt of that data.

MR. HEAD: Yes, sir.

MEMBER BROWN: Because it’s a field and it’s got a header, a footer, and it’s got little tags that say one thing or another.

MR. HEAD: Yes, sir. That is -- this is --

MEMBER BROWN: I would argue -- and let me interrupt you -- I would argue that it’s not impossible to have something not in the processing or generation itself, but something contaminated something coming in, where you end up with a corruption of some data which ends up with corrupted type data that goes out, which does have a header and a footer and is recognized as a message which may provide the wrong piece of information.

Now, do you want me to go through and do the zeroes and ones that would come up? Ain't going to happen.

MR. HEAD: No, sir.

MEMBER BROWN: But the point is it's not implausible or impossible that that couldn't happen. It's improbable; I agree with that.

MR. HEAD: I won't use the right word there, but I will note that it is -- that one signal now then has to agree with a redundant signal. There has to be two signals generated that have survived all of that to -- for the remote digital logic controller to take action.

MEMBER CORRADINI: So can I --

MEMBER BROWN: Mike, I'm not -- all I'm trying to do is make the point that we -- that people take digital and they say, ah ha, it magically is safe from all other things we have ever considered. And I just -- it's not true, and I agree with you that you have redundancies in the two signal -- it's better. I agree that it's better.

MEMBER CORRADINI: I think you have made

your point.

MEMBER BROWN: Yes. I'm just trying to help.

MEMBER CORRADINI: If you have more to answer, I'm just now just kind of managing time.

MR. HEAD: I think I'm done.

MEMBER CORRADINI: You're done.

MEMBER BROWN: I'm done.

MR. HEAD: I'm quoting from the certified design. I can do no more.

(Laughter)

MEMBER CORRADINI: So Scott was trying to help in terms of information for the staff. Do you have more questions of the staff at this point?

CHAIRMAN STETKAR: No. Thank you.

MEMBER CORRADINI: Any more, Tom? Go ahead.

MR. TAI: I think that was the last slide that we have.

MEMBER CORRADINI: All right. Any more from the Committee for Tom? Okay.

This is going to be, as the full Committee realizes, our chance to essentially comment on the COLA. So are there any questions not with the last topic but with any topic relative to the South Texas application?

If not, I'll thank the staff for a -- I guess you used the word long journey, for all your effort. Thank the applicant.

And at this point, Mr. Chairman, back to you. Oh, I'm sorry, I should ask -- I'm sorry. Yes, I forgot, I apologize. So are there any -- can we open the phone line to see if there are any public comments on the phone line, please? Maitri is going back to do her due diligence. And if somebody is on the line, can you please -- is there anybody in the audience that wants to make public comment?

MR. LEWIS: Yeah. I do have a public comment. When I --

MEMBER CORRADINI: Can you please identify yourself, please?

MR. LEWIS: Marvin, M-A-R-V-I-N, Lewis, L-E-W-I-S. Member of the public.

MEMBER CORRADINI: Go ahead, Mr. Lewis.

MR. LEWIS: Yeah. I've been watching this. Of course, I've been a little worried about this -- the degraded voltage business, and I'm real pleased to hear that you're finally admitting that there is something about shutting down your electrical equipment and nothing happened.

MEMBER CORRADINI: Marvin?

MR. LEWIS: I think it's very important that we do something like this, and I hope you're going to test it out thoroughly, so that you know it works. And you're just not going to sit down there one day when you need it, turn it on, and nothing happens.

Thank you.

MEMBER CORRADINI: Thank you, Mr. Lewis.

Is there anybody else on the line that wanted to make a comment? Okay. Hearing none, we will close the line.

Is there anybody in the audience that wants to make a public comment? Apparently not.

Mr. Chairman, back to you.

CHAIRMAN STETKAR: Thank you very much, and I also -- I'd like to thank the staff and NINA for its -- it has been a long journey, and I think we have had an awful lot of really effective discussions on this. And, again, I'd like to thank everyone for that.

And with that, we will recess until 10:45.

(Whereupon, the above-entitled matter went off the record at 10:26 a.m. and resumed at 10:45 a.m.)

VICE CHAIR BLEY: We're back in session. At this time we're going to hear about the generic letter on the treatment of natural phenomena hazards in fuel cycle facilities, and I'll turn it over to Dr. Powers.

MEMBER POWERS: Yes, we are going to talk about natural phenomena hazards at fuel cycle facilities. This is one more of the fallout from the events at the Fukushima Daiichi site. And the staff is proposing a generic letter. And I think it's very important to understand exactly what they're asking for in this generic letter. It stems from some of their findings in their inspections on some of the facilities.

With that introduction, I guess I will turn it over to Ms. Kotzalas.

MS. KOTZALAS: Thank you. Good morning. My name is Margie Kotzalas and I'm the chief of the Programmatic Oversight and Regional Support Branch in the Office of Nuclear Material Safety and Safeguards. And I want to thank you for allowing us to present this to you this morning.

As Dr. Powers had stated, using the lessons learned from the accident at Fukushima we completed a systematic evaluation and inspection of fuel cycle facilities to confirm that the licensees are in compliance with the regulatory requirements and their license conditions and to evaluate their readiness to address natural phenomena events.

Through this evaluation the staff identified generic issues regarding the adequacy of supporting documentation to justify the assumptions that the structure systems and components will adequately perform under postulated natural phenomena events and comply with the regulatory framework. Because of this we plan to issue a generic letter to collect information to verify compliance and validate the assumptions used in the facilities' safety analyses so that we can provide reasonable assurance of the adequate protection of public health and safety.

Now, for a more detailed discussion of the topics, the facilities in our regulatory framework on Part 70 and Part 40, I will turn the presentation over to two of the staff members who have worked very hard on these issues: Molly Semmes and Jonathan Marcano.

Molly?

MS. SEMMES: All right. Good morning. My name is Molly Semmes. I'm a fire protection engineer in the Division of Fuel Cycle, and I'm just going to give you a brief overview of our fuel cycle facilities and what they and what the hazards are, and then I'm going to pass it over to Jonathan. He's going to get more in depth about the generic letter.

All right. This is a map of all of our fuel cycle facilities in the United States, including operating plants and plants under construction. As you can see, most of the plants are in the central and eastern part of the United States. Each dot or triangle represents the different types of facilities. So, unlike reactors, each plant is unique of its own hazards and processes. And you can see we have a lot different types of plants.

This is the regulatory framework we use to license our plants. This is akin to Part 50 for reactors. Part 40 covers plants that deal with source material, which is in this case depleted uranium and unenriched uranium. We only have two licensees licensed under Part 40. Part 70 is where the bulk of our licensees are licensed, which includes plant that use special nuclear material, which would be our enrichment and our fuel fabrication plants. And Part 76 issues certificates for gaseous diffusion plants, although at this time we do not have any operating gaseous diffusion plants.

So, it's important to note going forward that the hazards of these fuel cycle facilities are very different from at reactors. There's no decay heat removal to worry about at these plants, so station blackout isn't really of concern to us. And also there's no possibility for multi-unit events to occur.

The main hazards that we are concerned about are criticality and chemical hazards. These plants have a lot of very dangerous chemicals; for example, uranium gas, which is in the form of UF_6, uranium hexafluoride, used for enrichment purposes. If it leaks it can react with the moisture in air and produce HF gas, which can cause very serious burns to workers and members of the public. A lot of these plants also deal with ammonia in a lot of their processes, which is very dangerous. In addition, soluble uranium powder presents an inhalation risk and inhaled uranium can pose a large dose to workers, a large dose risk.

VICE CHAIR BLEY: I'm just curious. I was looking at the facilities. Sequoyah Fuels out in Oklahoma, that closed?

MS. SEMMES: It did.

VICE CHAIR BLEY: It's gone?

MS. SEMMES: It is in decommissioning.

VICE CHAIR BLEY: Okay. It's in decommissioning now?

MS. SEMMES: Yes.

VICE CHAIR BLEY: Okay.

MS. SEMMES: So like I said, our other predominant hazard is criticality from stored special nuclear material. Our licensees are required to prevent criticalities in normal operating conditions. Another difference between reactors is that most of these accidents at our fuel cycle facilities are going to be really fast. There's going to be an accident and there's going to be a release. It's not like at reactors where you might have a slow build up of events that require a lot of operator action. We don't usually see that at fuel cycle facilities.

MEMBER CORRADINI: You don't see it or you don't -- it's just because of timing there is no assumption of operator action, allowable operator action to mitigate?

MS. SEMMES: There is usually no assumption.

MR. MARCANO: They may take mitigative actions to contain. That's normally -- there's involved. They can contain the material normally type of action that you will see.

MEMBER BALLINGER: But operator actions normally after the event begins, in effect?

MS. SEMMES: Yes. Well, the release is usually immediate at these facilities.

The emergency plan at these fuel cycle facilities is typically evacuation for workers and shelter in place for members of the public. And that's typically the extent of their evacuation plan.

So like I said before, the bulk of our licensees are licensed under Part 70. In September of 2000 we added Subpart H to our regulations, which incorporates a risk-informed performance-based integrated safety analysis, or an ISA. Licensees are required to perform an ISA that identifies all possible accident sequences for their facility, as well as the consequences for these accidents and the measures they are going to use to keep these consequences below the performance requirements in Part 70.61. These measures are referred to as items relied on for safety, or IROFS, as we call them. They also have to indicate the management measures they're going to use to make sure these IROFS are reliable and can be functional when called upon.

ISAs are a living document, so licensees are required to maintain them on site and they have to be updated to reflect any plant changes, and natural phenomena hazards are one of the things they have to consider when doing their ISA.

MEMBER POWERS: One of the items that I didn't quite follow entirely in your responses to comments about the draft generic letter was the review the staff had done on the ISAs with respect to external events. Would you elaborate on that?

MR. MARCANO: Yes, and I will --

MEMBER POWERS: If you're going to cover it later, I can wait.

MR. MARCANO: Yes.

MEMBER POWERS: Okay.

MR. MARCANO: I'll make sure I address that when we --

MEMBER POWERS: Good. Thanks.

MS. SEMMES: So, this flow chart shows the ISA process for analyzing accident sequences within the framework of the performance requirements. If the event is not credible, no further evaluation is needed. If it is a credible event with low consequences, no further evaluation is needed. If it is an intermediate-consequence event that is unlikely to occur, no further evaluation is needed. And if it is a high-consequence event that is highly unlikely or a high-consequence criticality event that is always subcritical as well as highly unlikely, no further evaluation is needed. If a licensee falls outside these performance requirements, they would have to add additional IROFS. For example, if they had an intermediate consequence event that was likely to occur, they would have to add additional IROFS to bring it within the framework of the performance requirements in 70.61.

MEMBER CORRADINI: So, I guess Dennis is -- so, from the standpoint of a risk analysis, you kind of do it backwards. First you look at the consequence. Then you examine the likelihood and you go through this logic diagram of if it passes these filters, then no further evaluation is necessary?

MS. SEMMES: Yes.

MEMBER CORRADINI: Do I understand this correctly?

MS. SEMMES: Yes.

MEMBER CORRADINI: Dennis? I must not.

MS. SEMMES: Dennis is going to take this question.

MR. DAMON: This is Dennis Damon from Fuel Cycle Division. Yes, that's the way it goes. If there's a threshold of consequences called intermediate consequences; and that's, for example, for a worker a chemicals it's serious or irreversible health effects. Persons off site it's AG-01, chemical, or five rem. And so there's these thresholds. If they're below that threshold, then they don't need to do --

MEMBER CORRADINI: Okay.

MR. DAMON: -- they don't need to follow this process.

MEMBER CORRADINI: And in your kind of fleshy-colored boxes are there also then frequency splits there, or is that more qualitative? I think I understand the blue boxes based on your answer, but those, are those frequency-based.

MR. DAMON: Yes.

MEMBER CORRADINI: Okay.

MEMBER REMPE: So, there were some questions from industry about could you give us a frequency and define it? And the response back from the staff is we don't do that. I'm paraphrasing. Could you elaborate a little bit about that, especially when you're talking about external events that are being considered now, why that's not being considered?

MR. MARCANO: Yes, that's been consistent with the regulatory framework, the regulatory framework requires licensees to submit a description of the definitions of the terms "unlikely," "highly unlikely," meaning the frequencies. And then there's guidance on the use of those terms in NUREG-1520, the standard review plan for the review of these type of licensees, but the licensee proposes the definition and the staff reviews and approves that definition.

MEMBER REMPE: So there can be a lot of inconsistency among different licensees on what's likely and unlikely and highly unlikely?

MS. KOTZALAS: This is Margie Kotzalas. The way I would answer that is each licensee has a different process, different hazards at their facilities, different likelihoods, so it is appropriate for the licensees to determine based upon their facility what these definitions are. And I wouldn't call them inconsistent. I would call them appropriate for each licensee.

MEMBER REMPE: But when you're starting to look at external events, which is the subject here, it seems like one could have a consistent numerical value for what's highly unlikely and unlikely.

MS. KOTZALAS: The high -- well, I don't

know. Can you help me with this one?

MR. MARCANO: Yes, what the staff guidance states is that they will provide those definitions consistent with the standard practice. So in our guidance it's just pretty much ensuring that those definitions will use the standard practice applicable to the natural phenomena hazard.

MEMBER REMPE: But you just can't give them a number for external events when they're asking for it?

MEMBER POWERS: Well, I think what you're saying is they could give them a specific number for an initiating event.

MEMBER REMPE: Right.

MEMBER POWERS: This is a more integrated frequency here. There's an initiating event and then something has to happen in the plant.

MEMBER REMPE: Right.

MEMBER POWERS: And that's where they -- they can give an exact number for the initiating event, or they can actually ask them to calculate the initiating event frequency. It's the next step that they can't give them a --

(Simultaneous speaking)

MEMBER REMPE: The next step I understand, it's hard, but the first step, it seems like that could be --

(Simultaneous speaking)

MEMBER POWERS: Yes, but it doesn't allow you to fill that box.

MEMBER REMPE: Right.

MEMBER POWERS: You have to do more that gets you into a facility-specific thing. Now all of this could be cured if we just required them to do PRA, but we didn't do that. So (laughter).

MEMBER REMPE: Thank you.

MEMBER CORRADINI: But you're -- just again, for my edification, you're kind of on the way there. I mean, if I understand Dana's explanation, you have the frequency of the initiator. Then you have essentially the response of the system for this thing. This breaks, that doesn't work, whatever. And the process for that is standardized, or is it very site and facility -- or technology-specific? It's the latter again?

MEMBER POWERS: Yes.

MEMBER CORRADINI: Okay.

MEMBER POWERS: Yes, I mean --

(Simultaneous speaking)

MEMBER RYAN: But I guess from firsthand

experience I can tell you that for a fuel cycle facility that it's very important to get it tailored to that facility.

MEMBER CORRADINI: Okay.

MEMBER POWERS: There are no two of these that are alike and they're designed over 50 years of codes and things like that.

MEMBER RYAN: And some may not be driven by radiological material. It might be driven by chemistry, chemical materials or flammable materials. So when you've got risks that sometimes are synergistic toward a negative end and risks that sometimes are not synergistic at all, it's real hard to get all the boxes defined out.

MR. MARCANO: Correct. And making that connection with regards to the -- in terms of the -- let's pick a seismic event -- make that connection with what will be the initiating event frequency or the return peak of that frequency. That will really depend on what's the facility risk. Because depending of what type of facility, if it's more complex, then you will expect licensee to use a more stringent criteria. So you will have to look at all this big picture and then determine whether that basis for that return period of the earthquake is adequate with the risk for the facility, that the risk that the facility poses to the public and the worker. So it's very difficult to set up a one-step fit-all.

MEMBER REMPE: Okay. Thank you.

MEMBER SCHULTZ: Well, the difference is in the facility to facility, both in terms of what the potential consequences of the events are. That's why you start with the consequences, because of these differences, not only from one particular type of facility, but the different type of facilities that have to be regulated.

MR. MARCANO: Correct.

MS. SEMMES: If there are no more questions, I'm going to pass along to Jonathan.

MR. MARCANO: All right. Good morning. My name is Jonathan Marcano and I'm a structural engineer with the Office of Nuclear Material Safety and Safeguards. In this part of the presentation I will be giving you an overview of our post-Fukushima actions at fuel cycle facilities, how we evaluated fuel cycle facilities in light of the lessons learned from the accident, and discuss the results of our evaluations and the scope and purpose of our generic letter.

Next slide. So soon after the March 11,

2011 Japan earthquake and tsunami the staff issued Information Notice 2011-08 to inform licensees of the potential challenges when dealing with natural phenomena hazard events and suggested facilities to review and consider actions to cope with severe natural phenomena events.

After the issuance of the information notice, the staff issued Temporary Instruction 2600/0015 to conduct inspections at fuel cycle facilities to confirm that the licensees were in compliance with the regulatory requirements and license conditions to evaluate their readiness to address natural phenomena hazards and to collect information to determine if additional regulatory actions were needed.

The temporary instruction was conducted in three phases. The first phase involve a review of the licensing basis for its facility. The licensing basis events considered were seismic hazard, high winds, flooding, external loss of power and emergency power and fire impacts. The second phase --

MEMBER SKILLMAN: If could ask, why weren't precipitation events considered?

MR. MARCANO: We look at precipitation when we did the analysis of flooding, but we were most looking for big events in terms of events that could render the facility prevention of mitigation measures. Let's say, how can I impact the preventive mitigation measures? Like Molly stated earlier, for the majority of these facilities if there's an event they can render the facility in a safe configuration. So if there's time, they can take actions to put the facility in a safe condition. Did that --

MEMBER SKILLMAN: I understand your words, but I would challenge you there are facilities that can be threatened by extraordinary precipitation, whether it's horrific snowfall or remarkable rainfall. And unless the facility is properly designed, that leads to a flooding event.

MR. MARCANO: And all the licensees are required to look at all natural phenomena events and consider all the impacts to natural phenomena events. They consider that in their ISA.

MEMBER SKILLMAN: Thank you.

MR. MARCANO: The second phase was to perform inspections at the licensees to ensure that the prevention or mitigative measures were adequate and that they were being maintained by the licensees.

And the third phase involve an assessment of the adequacy of the emergency prevention measures to cope with the consequences of selected beyond-design-basis events.

The inspections were performed from December 2011 and were completed at the end of May 2012.

This slide present a list of the facilities inspected. As you all can see, the majority of the existing operating facilities were inspected. The facilities not inspected includes those recently reviewed by the staff, facilities that were recently built such as the Louisiana Energy Services, or those that do have a license, but are not -- that construction have not started.

MEMBER REMPE: So of those that are listed there that you inspected, how many did not have adequate documentation for the basis of the exceptions --

MR. MARCANO: The --

MEMBER REMPE: -- that they used?

MR. MARCANO: We opened this -- and in my next slide I will talk about the unresolved items that were open. But for all facilities except the Paducah Gaseous Diffusion Plant the staff open a resolve items.

MEMBER REMPE: Okay.

MR. MARCANO: So there's --

MEMBER REMPE: Almost all then? Okay. Thanks.

MR. MARCANO: Yes. And in the background slide I listed all the inspection reports that document the unresolved items.

In these slides I want to talk about the results of our temporary instruction inspection. The staff identified potential safety concerns at the Honeywell Metropolis facility regarding a large release of UF_6 under seismic and tornado events. At the time of the inspection the licensee was performing maintenance and was shut down and the staff took immediate actions to address the issue. The licensee committed to remain in a shutdown condition until completion of all the corrective actions. The staff issued a confirmatory order documenting the commitments from the licensee. The licensee retrofitted the facility and completed all the actions in the confirmatory order, and the confirmatory order was closed last year.

For the rest of the fuel cycle facilities inspected the staff did not identify immediate safety concerns, however, the staff identified potential compliance issues with regards to the existing regulatory framework. As Molly described earlier, Part 70 requires licensees to conduct and maintain an integrated safety analysis that addresses the impact of natural phenomena hazards.

VICE CHAIR BLEY: Is that part of the ISA or is that something separate?

MR. MARCANO: That's the requirement for the ISA, to perform --

VICE CHAIR BLEY: Thank you.

MR. MARCANO: -- conduct and maintain integrated safety analysis for the facility, appropriate to the facility, considering the magnitude, the likelihood, all the consequence -- all the accident sequences and --

VICE CHAIR BLEY: Okay.

MR. MARCANO: During inspections -- and this goes to your question, Dana -- during inspections we identified that licensees have not clearly documented the assumptions using the ISA is, well, due to sometimes incomplete or lack of design information of the facility with regards to natural phenomena hazards. And as we talk before, we open and resolve items to further verify how these licensees are in compliance with the regulatory requirements.

For example, the majority of these

facilities assume one of their assumptions in the ISA was that the facility will adequately perform under a postulated natural phenomena hazard. That was the assumption in the ISA. However; and like as Molly said, the licensees maintained the ISAs at the site. So when we preformed the inspections we noticed that at the time of the inspection some of these licensees did not have the information on site.

Some of them had perform -- contractors perform those analyses, so some of them we'll try -- we're going to try to reach -- gather all that information. Or some -- in other cases, given that these facilities were built from 1950 to 1990s they were built to local building codes that have either limited considerations for certain natural phenomena hazards.

So that's where kind of we started looking into we need to verify that the assumptions that we can document and we -- that are appropriate documentation to support those assumptions made in the ISA.

MEMBER SCHULTZ: These were planned inspections?

MR. MARCANO: Correct.

MEMBER SCHULTZ: And was an inspection

plan provided to the facility so that -- they knew what you were going to be looking for, but some of them did not have the information on site when you inspected. Is that what you're saying?

MR. MARCANO: The temporary instruction, it's pretty much an temporary instruction procedure.

MEMBER SCHULTZ: Yes.

MR. MARCANO: So it did lay down what were the staff objectives for the --

MEMBER SCHULTZ: Provided prior to the inspection? I'm just trying to get a sense of -- it wasn't a surprise inspection that you performed?

MR. MARCANO: No.

MEMBER SCHULTZ: Unannounced audit or --

MR. MARCANO: No, no. No, no.

MEMBER SCHULTZ: Okay.

MR. MARCANO: No, no.

MEMBER SCHULTZ: But yet all the information that you were expecting to see at the facility wasn't there, is what you're saying?

MR. MARCANO: Right.

MEMBER SCHULTZ: Thank you.

MEMBER POWERS: Yes, I mean, this is very similar to the situation we encountered on the licensing basis for fire protection, that we found that when you look for the supporting documentation, sometimes it was just not there and difficult -- or in fact most plants were reporting it's on the order of a $1 million to assemble that which they are required to have available. And that seems to be the situation here, that -- a very analogous situation.

VICE CHAIR BLEY: Well, in cases -- and I know we're going to get to this later -- in cases where they don't have the information to support the design basis are you asking them to reconstruct it or are you asking them for some alternative reason to believe that it's satisfactory? What's the onus on the facilities right now, the ones who had open items that are still open?

MR. MARCANO: Well, the responses will depend on what type of, let's say, assumptions they want to use to -- as their basis on how they demonstrate how they meet the requirements. So you may have multiple varying, depending on the facility on how they will demonstrate. Some facilities will have all documentation available for all the components they can --

VICE CHAIR BLEY: I might not have asked it right. What I'm asking you is if they don't have it and your inspection showed they don't have it, what do they have to do about it? Are they under an order to do something? Are you still evaluating? Where does it sit?

MS. KOTZALAS: That's the purpose of our generic letter.

VICE CHAIR BLEY: Okay.

MS. KOTZALAS: So why don't -- maybe we can move to that. I think it's the next slide.

MEMBER POWERS: I think it's very important to be very clear about what the generic letter is asking for here. The onus on them is to provide information. Do you have this information? Okay. And if they don't have the information, then do you need to make remedial actions? And the answers are what they are. Then the staff will make a decision based on that information that they get. So the onus right now is to respond to two questions.

MR. MARCANO: Correct. And that's why you see the lay down of the requested actions. The first of requested actions pretty much tells them do you have the information on site?

MEMBER POWERS: Yes.

MR. MARCANO: And then the second set of requested actions, if you identify a gap, then tell me what's your plan to come into compliance? Are you going to do modifications to your facility? Can you perform additional analyses to demonstrate that the as-built condition of the facility can cope with the event? So that will depend on the situation of each facility.

MEMBER POWERS: Now, it seems to me it's entirely likely that someone can respond to you and say I have the information and I have identified no gaps, that when you subsequently review the information that you might identify gaps. But I mean, and things will take their course after that.

MS. KOTZALAS: Correct.

MEMBER POWERS: So it is not -- you're not -- there's no requirement that they come in and say I can assure you positively absolutely there are no gaps here. It's simply that I haven't identified any gaps.

MS. KOTZALAS: Yes, we will conduct a technical review of their submission.

MEMBER POWERS: Yes, one of the questions I had -- you don't have a large number of facilities here, but there's a sample of them, and your organization is not a large organization. You're asking for these in 90 days. They all come flooding into you in 90 days. How long is it going to take you to get through all of them?

MS. KOTZALAS: That is one of the management challenges and we have been assembling teams and looking for other individuals, contractors, other support. So, yes, that is our next challenge.

MEMBER POWERS: How long do you think it will take you through to review those responses?

MS. KOTZALAS: Well, we're going to prioritize them based on what we think is the most safety-significant. I think that we should be able to at least do a quick review to determine that there are no immediate safety concerns within probably 60 days, something like that. And then we will work through them. We also have inspection support from the regions that will be helping us.

MEMBER POWERS: Oh, okay. I forgot about that.

MS. KOTZALAS: So I'm thinking -- I haven't -- Marissa, please?

MS. BAILEY: This is Marissa Bailey. I'm the director for the Division of Fuel Cycle Safety Safeguards and Environmental Review. We do have the resources planned to conduct the review for the responses to this generic letter, so we've already budgeted for that including human resources also contractual dollars. So we're anticipating getting the receipt this fiscal year and reviewing them this year and possibly next year. So we do have the resources for that.

MEMBER POWERS: Right. It's just that the time frame is short on it and if you can't review them, then did you give consideration to having them stage them collegially among themselves, stage them at the rate that you can review them.

MS. KOTZALAS: I don't anticipate it would be that big of a challenge to review them all. And we want to get all of the responses to ensure that there is no immediate safety concern.

MEMBER POWERS: Okay. Because you've got to plan out what kind of additional regulatory actions you're going to take, and so you need to know the --

MS. KOTZALAS: Correct.

MEMBER POWERS: -- length and the breadth and depth of -- I understand.

MR. MARCANO: So as part of our systematic evaluation of the fuel cycle facilities we used the information and results that we gathered from the inspections to evaluate the applicability of the 12 Near-Term Task Force recommendations to determine if additional regulatory actions were needed. The results of our evaluation concludes that the current regulatory framework is adequate to protect public health and safety, but as we've been discussing here we identified potential compliance issues with the existing regulatory framework and this is why we are in the process of developing the generic letter to collect the information from the licensees.

MEMBER SCHULTZ: Jonathan, are we still talking about here the current licensing, the current basis for evaluating the license with regard to external events? You had those. And we also need to consider more significant external events. But are we still talking about those externals events for which the facility was originally licensed?

MR. MARCANO: When we -- you're referring one of our previous slides when we --

MEMBER SCHULTZ: Yes, the earlier slide that described the Fukushima response, which was, well, there is a design basis for the facilities, and they have that. And you said you went out to inspect and some of them didn't have that --

MR. MARCANO: Correct.

MEMBER SCHULTZ: -- information well codified. But then in addition the first intent was after we finish round one, we're going to look at beyond the design basis external event.

MR. MARCANO: Yes, we look at those. And in that case what we did for these facilities we completely challenge the measures that they have on site to ensure that they can still mitigate the consequences of an event. And we did not identify any issues with that, so our concerns are with the actual design basis --

(Simultaneous speaking)

MEMBER SCHULTZ: Okay. Therefore we can call it compliance?

MR. MARCANO: Compliance.

MS. KOTZALAS: Correct. And it is important to note that the regulations require licensees to periodically update their integrated safety analyses with the current knowledge, with the current state of science. So it is a living document.

MEMBER POWERS: So with respect to the revised USGS Seismic Hazard Survey, I mean, this gets into the backfit business here. And the Part 40 facilities don't have a backfit rule to them.

MS. KOTZALAS: Correct.

MEMBER POWERS: But the 70 and 76 facilities presumably do. So your contention is that for the ISA, once the USGS notice came out, then they would be required to upgrade their ISA in response to that?

MR. MARCANO: Evaluate the impact of that information in their ISA and make --

MEMBER POWERS: Yes.

MR. MARCANO: -- take actions accordingly.

MEMBER POWERS: Yes.

MR. MARCANO: So this slide pretty much summarizes all our actions: the inspections, how we used Near-Term Task Force recommendations to evaluate the fuel cycle facilities, to pass forward for the issuance of a generic letter. And last, we've been discussing here, ensure -- verify compliance. After we receive the information from the licensees, we'll perform inspections, we'll document our review and hopefully close the actions with the generic letter.

I want to get more into the details of the generic letter. We've been saying all along that the generic letter is an information collection tool and the outcome that we want to get out of it is a clear basis and a clear documentation of how the facilities cope with the natural phenomena hazards.

That being said, consistent with the regulatory requirements the generic letter requests licensees to submit the definitions of unlikely, highly unlikely and credible for natural phenomena events as they use it in their integrated safety analysis, provide the documentation to support the assumptions in the ISA. For the integrated safety analysis in terms of more details, what is the likelihood and magnitude of the event, what are the potential accident sequences, the consequences are and do you need any items relied on for safety to prevent or mitigate the consequences?

Submit a description of the changes to the hazard applicable to the site versus what the facility was designed to, and then submit a summary of the results for any walkdowns to evaluate degraded conditions or potential changes to the facility that may impact the performance of that facility under a natural phenomena hazard.

Then second set of requested actions, as we said before, is there's a gap, identify any vulnerabilities in a component, provide additional analysis or documentation to demonstrate how the facility satisfy the current regulation.

So in summary, the staff perform a systematic evaluation of the fuel cycle facilities and we identify generic issues regarding compliance with the regulatory requirements with natural phenomena hazards. The generic letter will be used to collect information from licenses, and the outcome is to evaluate the assumptions used in the ISA and how the facility provides for adequate protection under natural phenomena events.

That concludes my presentation.

MEMBER POWERS: Any other questions on this? I think the conundrum that we face with these facilities arises because in fact by and large they pose a relatively small risk to the public health and safety inherently because of the nature of the material they have. But I don't think that consideration comes into play yet. It may come into pay once we have all of this information and decide on additional regulatory action, but right now I think that that concern about risk is off the table and now we're talking more of a compliance issue, if my understanding is correct.

MEMBER RYAN: I couldn't agree with you more. I think there's a couple of things, like for example initiating events. If they have large quantities of flammable materials with some radioactive material in it, that's a whole lot different than if you have some solid radioactive material sequestered in the same amount of solid material. So it's very interesting that the combination of risks can sometimes be additive or super additive based on the arrangement, the time of the year, the physical environment, all those things.

MEMBER POWERS: Yes, you don't want to --

(Simultaneous speaking)

MEMBER RYAN: And correct me if I'm wrong; that this was a question for the staff, if that's not so, let us know how it's done. But I think this has such a wide variety, it's hard to be prescriptive in requirements in an exact way. You sort of have to say here's the template. And, okay, now let's say what they've got and see what fits and that sort of approach. So it's a little different than perhaps what we're used to for reactors where there's a lot of similarities from facility to facility. Well done.

MR. MARCANO: Thank you.

MEMBER POWERS: If there are no additional --

VICE CHAIR BLEY: Yes, I had just a little bit.

MEMBER POWERS: Wouldn't you know it? (Laughter)

VICE CHAIR BLEY: You used a word early on that always leaves me puzzled, and I'm not sure what your guidance is on it. In that first chart that

Molly showed you had for -- the discussion about -- the hazard part makes sense. If the hazard is not enough to cause a problem, you certainly don't need to spend any time working on it. But you also have the credible and non-credible. What's your guidance on the -- how do I decide something's non-credible to the extent I don't have to look at it? Is it a frequency argument? A likelihood thing? If it's the consequence thing, I have no trouble with it. But if it's the other one, I don't know what it means and I wonder how you tell people what it means.

MR. MARCANO: I would like Dennis to answer that question.

MR. DAMON: This is Dennis Damon again from Fuel Cycle. The word "credible" does appear in the regulation. It appears in the statement that all credible high-consequence events have to be made highly unlikely. And then also licensees are required to state how they are going to define "credible." And the guidance on an acceptable definition was provided in the standard review plan. And it's basically three criteria, but the two best ones are if you can demonstrate that it's physically impossible for the event you thought of to occur.

VICE CHAIR BLEY: I like that one.

MR. DAMON: Yes.

VICE CHAIR BLEY: (Laughter)

MR. DAMON: That takes care of credible. So it's an argument that we -- hypothetically if it sounds like it could happen, we did some analysis and it shows that it actually cannot happen.

And then the other one is an external hazard like these that can clearly be shown to be less than 10 to the minus 6 per year.

VICE CHAIR BLEY: Okay. Is that in your guidance?

MR. DAMON: Yes, it's in the guidance.

VICE CHAIR BLEY: Okay. So we do have a fixed frequency on that. Okay.

MR. DAMON: For screening. That's just for screening.

VICE CHAIR BLEY: For screening? Okay.

MR. DAMON: And that's consistent with Commission's guidance on, for example, independent spent fuel storage installation screening of events. MMI 6. --

VICE CHAIR BLEY: In a lot of other places we've been trying to get rid of that word, but as long as you have it well defined, that's good. Okay. That was all then.

MEMBER SCHULTZ: Are the licensees commenting that the suggested schedule for information collection and then additional information is impractical given where they are and what you're asking for?

MEMBER POWERS: The articulated response to that was the staff had shared with them the generic letter in advance and that because of that they thought that the schedule was practicable.

MEMBER SCHULTZ: Okay.

MEMBER POWERS: Had it not been shared in advance, that it would be impracticable. So I think my impression I came away with was kind of on the edge. It wouldn't surprise me if somebody came back and asked for an extension.

MEMBER SCHULTZ: Yes, but not --

MEMBER POWERS: Not a generic one, but --

MEMBER SCHULTZ: Right.

MEMBER POWERS: -- an individual might ask for an extension.

MEMBER SCHULTZ: And not a considerable one, necessarily?

MEMBER POWERS: Yes, I mean, that was my impression that I got from the exchange and the response on that.

MR. MARCANO: Yes.

MEMBER SCHULTZ: With regard to the performance requirement and the description that was originally presented in that diagram, credible, and then looking at the consequence of the event prior to doing a determination of the likelihood, I saw that and I thought that was certainly appropriate for the facility, but what you're asking for in 90 days associated with the integrated safety analysis very quickly gets to look like a probabilistic safety assessment evaluation. Likelihood and magnitude, the sequences, the consequences and so forth. Are we leaving behind the description of focusing on consequences and the events that can happen by going into perhaps too much detail about accident sequences and so forth that in fact would turn out to be highly unlikely? In other words, doing a lot of analysis for no important result.

MEMBER CORRADINI: So you're saying screening analysis --

MEMBER SCHULTZ: Yes.

MEMBER CORRADINI: -- may get rid of some things?

MEMBER SCHULTZ: Yes, originally it looked like it was set up as if it would be an appropriate screening analysis and evaluation for fuel cycle facilities. Now we just do the definition of unlikely, credible, highly unlikely and then we fall into, okay, now present your integrated safety analysis, which looks like an evaluation where one might get trapped into focusing on what would be shown to be when you get down to the part 2. The accident sequence and so forth is not an important track to follow.

MR. MARCANO: I'm not -- that's --

MEMBER SCHULTZ: Rather than I've got this issue that might be considered a hazard, but just -- we set it up. The facility is designed. So it's not going to be an event that has consequences. I don't care what causes it: a flood, an earthquake or a hurricane. It's not going be of consequence. That's where I thought we were at the beginning.

MR. MARCANO: I don't anticipate that we will get into that. And with natural phenomena events it's more complicated than that because it's not only a screen-out base on the likelihood, because obviously it's a hazard curve, so there's some events that can happen up until that, let's say a 10 to the minus 3 event that can still cause damage to your facility, can still cause damage to your components. So hopefully the licensee responses will take that into consideration and we'll, like you said, either come forward and demonstrate that up until this event either the facility system structures and component can withstand the event or the consequences are negligible.

MEMBER SCHULTZ: Okay. Thank you.

MEMBER POWERS: Any other questions?

MEMBER SKILLMAN: Let me ask you to go back to slide 17 for a second. No. 16. I'm sorry. Sixteen. Sixteen. Information you're collecting. It's description of changes to hazards applicable. By chance did you ask for changes to IROFS? I kind of assume IROFS changes would show up in the ISA, but I know because I've been involved in fuel cycle, or in fuel facilities that when you discover a vulnerability, very often you apply a new IROF and a management measure to back up the IROF. I also know that there's a pretty good effort underway to reduce IROFS because they are administrative items that take a lot of time and a lot of effort. So a sneaky way to reduce effort is to get rid of IROFS without having done a thorough evaluation. So I'm wondering if that's part of your research.

MS. KOTZALAS: Well, we are asking for any changes. We say changes to hazards applicable to the site. That also includes -- that would be reflected in an integrated safety analysis which would then contain the IROFS that we would evaluate.

MR. MARCANO: Yes, and during their evaluation they can take credit for IROFS that are already existing at the site that can help under a natural phenomena event prevent or mitigate the consequences. So hopefully they will take credit of all those existing IROFS that they have in place that they have existing management measures on the -- we know through inspections that they contain. So we may be in a situation, like you said, that they may identify a gap and that they may propose a new IROFS or additional management measures to an existing IROF. But that would all depend on the licensee's evaluation.

MEMBER SKILLMAN: Fair enough. Thank you.

MEMBER SCHULTZ: Jonathan, on that slide what are you expecting to be the result of the walkdowns? I'm not quite clear on summarizing the results; for example, evaluation of degraded conditions. That's something that -- degraded condition would be something that wasn't appropriately designed for the licensing basis or something that is not appropriately designed for the --

(Simultaneous speaking)

MEMBER RYAN: Steve, I'd offer a friendly amendment. It's not just designed. It's designed and maintained.

MEMBER SCHULTZ: Oh, okay. Okay.

MEMBER RYAN: I think the real risk is in the maintain part.

MEMBER SCHULTZ: Thank you.

MEMBER RYAN: So that would be my focus.

MR. MARCANO: Correct.

MEMBER SCHULTZ: Well, originally it was intended to be like the following, but things have changed over time.

MR. MARCANO: Correct. Given that these facilities were constructed so long ago things have changed.

MEMBER RYAN: And it could be something similar as wear and tear.

MEMBER SCHULTZ: Of course.

MEMBER RYAN: I mean, it --

MEMBER SCHULTZ: Yes, I understand.

MEMBER RYAN: So, anyway. Sorry.

MEMBER SCHULTZ: I've seen it. Thank you.

MEMBER POWERS: Any other questions?

(No audible response)

MEMBER POWERS: You're going to get tired of me say that, aren't you?

(Laughter)

MEMBER POWERS: Well, thank you very much. I would like to compliment you on particularly the introductory and explanatory part of the package on the generic letter that you prepared. I thought that was a very good explanation of what the situation was and what the applicable regulatory constraints were.

And with that, I'll turn it back to you --

VICE CHAIR BLEY: I guess we ought to ask for comments. Can we get the phone line open?

Any comments from the room?

(No audible response)

VICE CHAIR BLEY: And we'll wait just a second and then we'll --

MEMBER POWERS: And I really enjoyed reading the package. It was really very well written and --

(Simultaneous speaking)

VICE CHAIR BLEY: If anybody on the phone line would like to make a comment -- any comments on the phone line?

(No audible response)

VICE CHAIR BLEY: In that case, I think we're done. Thank you very much.

MR. MARCANO: Thank you.

VICE CHAIR BLEY: I have a question. We're going to write a letter on this?

MEMBER POWERS: We are going to write a letter.

VICE CHAIR BLEY: You have a draft?

MEMBER POWERS: I do not.

(Laughter)

MEMBER POWERS: Not yet.

VICE CHAIR BLEY: Mike, you have a draft. We're not due to start again until 1:15. Can we read through your draft in half an hour?

MEMBER CORRADINI: We could do it probably --

VICE CHAIR BLEY: At 12:35?

MEMBER CORRADINI: Yes. If I work hard, yes.

VICE CHAIR BLEY: Well, if you --

MEMBER CORRADINI: No, I can do it.

VICE CHAIR BLEY: Okay.

MEMBER SCHULTZ: The applicant wanted to attend, and I think some of them are planning to be here at 4:30.

VICE CHAIR BLEY: Oh, okay. We'll wait then. That's good. We'll reconvene at 1:15. We are in recess.

(Whereupon, the above-entitled matter went off the record at 11:38 a.m. and resumed at 1:00 p.m.)

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

1:15 p.m.

CHAIRMAN STETKAR: We are back in session. And before we begin this afternoon's session, I have a bit of breaking news that I'd like to announce. ACRS Member Dr. Dana Powers has just been elected as a member of the National Academy of Engineering.

(Applause)

VICE CHAIR BLEY: Now he is truly acamedician.

CHAIRMAN STETKAR: Well, I have to characterize him here as an engineer, so let me get through this first, because there are some difficult things that I need to say.

Election to the National Academy of Engineering is among the highest professional distinctions, and that's absolutely true according to an engineer. Academy membership honors those who have made outstanding contributions to engineering research, practice or education including, where appropriate, significant contributions to the engineering literature and to the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering or developing/implementing innovative approaches to engineering education. And it's well deserved.

(Applause)

MEMBER POWERS: Thank you.

CHAIRMAN STETKAR: And with that we will turn over the first session on the Watts Bar to Harold Ray. Harold, it's yours.

MEMBER RAY: Thank you, Mr. Chairman. We'll now consider Tennessee Valley Authority's application for an operating license for Watts Bar Nuclear Unit 2. The application was submitted in 2009 in the first of nine meetings when our Plant Operations and Fire Protection Subcommittee was held in July of that year. The most recent Subcommittee meeting was held on January 13th, 2015.

The Committee issued an interim letter on November 26th, 2013. In that letter we summarized our view up to that point indicating that we had not identified any issue that we did not expect to be satisfactorily resolved prior to the then-scheduled OL issuance, and we listed a number of items for our further review. These items were reviewed at the recent meeting of the Subcommittee and they will be summarized here again today.

Unit 2 is the second unit of a dual-unit plant seeking an OL in accordance with 10 CFR Part 50.

Each of the two units uses a four-loop Westinghouse nuclear steam supply system with an ice condenser. Unit 1 entered service in 1996.

As the second unit of a dual-unit plant, Unit 2 licensing basis is the same as the current licensing basis for Unit 1. This was affirmed by the Commission in an SRM, which is SECY 07-0096 issued in July 2007. An example of this which we will touch on today is the change to the Unit 1 updated FSAR concerning hydrology, which was finally approved just last week and will therefore be applicable to Unit 2 as well. This change was requested by TVA in 2012 and was included in our 2013 interim letter list of items for further review and was reviewed at the Subcommittee meeting last month.

Although this far from the first case of the second unit of a dual-plant to enter service, Unit 2 is unique insofar as the length of time which has elapsed since Unit 1 entered service and the fact that construction of Unit 2 was suspended for a lengthy period prior to be resumed about eight years ago. Thus, we will hear explained additional attention has been devoted to potential consequences of these unique circumstances. And to begin I'll turn it over to Michele Evans.

MS. EVANS: Thank you. Good afternoon, everyone. My name is Michele Evans and I'm the director of the Division of Operating Reactor Licensing in NRR. We appreciate this opportunity to brief you today on the details of our review of the Watts Bar Unit 2 operating license application. We conducted an interim briefing of the Full ACRS in November of 2013 and we had our final briefing of the Subcommittee on January 13th of this year.

Today the NRC staff will present to you results of our very thorough safety and technical review of TVA's application. The staff has been the reviewing the licensee's application since the 2009 time frame. I have been closely involved in the staff's review efforts since October of 2011 when I became the director of DORL. In this position I also serve as the chairman of the Watts Bar Reactivation Assessment Group. This assessment group provides oversight and management direction for NRC staff licensing and inspection-related activities to ensure that Watts Bar Unit 2 meets all the relevant regulatory requirements and can be operated safely.

I am aware that significant staff effort has occurred during the past several years to conduct our review of all of the licensing items including the items which we have previously discussed with the Subcommittee and will highlight to you today.

During the course of our review the staff had frequent communications with the licensee and conducted several on-site audits and numerous conference calls to discuss various aspects of the application. The thoroughness of the review is supported by the fact that over the past year we have had routine weekly public meetings with the licensee at which technical concerns were identified, discussed and resolved.

We are planning that this briefing will be our final presentation to ACRS on our review of the Watts Bar Unit 1 operating license application, provided we adequately address any questions you may have today. At this time we are looking for the ACRS to provide a positive recommendation to the Commission regarding the application.

Our licensing review is nearing completion with only a few open items remaining. Focus of the NRC efforts have continued to shift more to the areas of inspection and testing which Region II will be discussing in more detail later this afternoon. Based on progress that has been made to date and the licensee's schedule going forward, we are expecting to be able to put forth a Commission vote paper for the operating license in this time frame. This would support the licensee's current schedule for fuel load.

We'd like to thank the ACRS staff who assisted us with the preparations for the meeting today. And at this point I'd like to turn over the discussion to our NRR project manager, Justin Pool, who will provide an overview of the agenda for the day. Justin?

MR. POOLE: Thanks, Michele. As you can see here on slide 2, the general agenda for the meeting today will be TVA will go first providing an overview of project status followed by how they resolved the issues identified in the ACRS November interim letter. Following TVA's presentation the staff will come up here, first go over a summary of what was previously presented to the Full Committee back in November of 2013. We'll then go on to talk about the closure of the open items that were identified in the November ACRS interim letter, followed by a presentation by Bob Haag on inspection status, and then a brief presentation on upcoming milestones for the project.

If there's no questions, I'll turn over to Mr. Paul Simmons from TVA.

MR. SIMMONS: Good afternoon. My name is Paul Simmons. I am the Vice President of the Watts Bar Unit 2 Start-up. And I'll ask my team to introduce themselves.

MR. AHN: I'm Gordon Ahn. I'm the licensing manager for Watts Bar.

MR. HILMES: Steven Hilmes. I'm the electrical and I&C design manager for Watts Bar Unit 2.

MR. KOONTZ: Frank Koontz, engineering specialist, Unit 2 engineering.

MR. SIMMONS: In addition to Steve and Frank, we'll also be hearing from Gary Mauldin and Mike Bottorff, the senior license at Watts Bar, as part of our presentation.

Page 2 you'll see our overview of where the Watts Bar Unit 2 project is. I'll cover that. And then we have the ACR requested topics that will include the Eagle 21 two-way communication testing. Steve Hilmes will be covering that. Thermal conductivity degradation, General Design Criteria 5 and containment recirculation sump will be covered by Frank Koontz. The hydrology will be covered by Gary Mauldin. And the fire protection operator manual action feasibility will be covered by Mike Bottorff, senior license for Watts Bar Nuclear Plant.

Next, please. So the Watts Bar Unit 2 guiding principles continue to focus on three primary things: Safe and high-quality execution of the work, the design basis fidelity with Watts Bar Unit 1, and then system structures and components that are rebuilt, refurbished or replaced to ensure safe operable commercial operations for Watts Bar Unit 2.

From a safe and high-quality standpoint, we've accumulated over 31 million man hours of continuous work that's been performed at that station with a lost time accident. We're at 97 percent on our work completion through the work control process on first inspection, and we continue to strive to work for improvements in both of those areas.

The design basis fidelity for Watts Bar Unit 1 ensures that we have a common license for our licensed operators. It assists us in how we execute the work and performing work both from a maintenance standpoint and from an operator's performance in the plant.

And then the last piece is on our system structures and components. Some examples are in our primary side, reactor coolant side we replaced the reactor coolant pump internals, refurbished the reactor coolant pump motors and we've replaced safety injection or emergency core cooling vent valves to ensure that we're providing the appropriate ALARA considerations for our work force doing that work.

We've also replaced our ESF, our engineered safeguards feature, RHR pump, refurb'ed those and replaced the heat exchangers. And we've replaced all eight of our essential raw cooling safety-related pumps.

These are just a few of the examples of the things that we've done as part of this Unit 2 project to ensure that we have an operating asset that operates safe and reliable for the Watts Bar station.

Milestones that we've completed. We have completed the reactor coolant system primary cold hydrostatic test meeting all of the acceptance criteria for the ASME Code. We've completed our steam generator hydrostatic test and our secondary hydrostatic test.

And as of today we have achieved the required temperature in the Unit 2 ice bed. We're approximately 17 degrees in that ice bed and I expect to commence ice making and blowing ice through the system to ensure that we don't have any issues from that standpoint that will facilitate us stepping into a significant milestone that has not been achieved without a lot of close coordination between the construction project and then the operating plant. And we expect to meet our milestone for initiating the ice load of Unit 2 on or before February the 28th. So that's a real positive for the station and I'm excited for what's been achieved there.

Also -- yes, sir?

MEMBER SKILLMAN: Approximately how many tons of ice will you --

MR. SIMMONS: Our tech spec requirements are 2.2 million pounds of ice. And we'll blow the ice in all of the 1,944 baskets. And then at some point in time; and I don't have the exact time period, it will probably be after we complete the containment integrated leak test that we have to do, we'll stop into doing the required weighing of those ice baskets to make sure that we meet all those tech spec requirements prior to us entering mode 4 power extension testing for Unit 2.

MEMBER SKILLMAN: Thank you.

MR. SIMMONS: Of upcoming other milestones significant will be the hot functional testing, which we're forecasting for March of this year with a forecast for fuel load of June of this summer.

Next slide. So in preparation for dual-unit operation we do have an operating organization that is engaged. They're driving the turnover of systems and components in preparation for dual-unit operation. We have a staff that is trained. We have the right number of folks there for both operations, maintenance, engineering and other organizations to support the dual-unit operation.

We've completed all of the required training to support dual-unit operation and we have an organization that is engaged, including the milestones, both from a construction project standpoint and from the operating plant standpoint, that supports the safe transition from construction project into commercial operation.

And with that, if there's no questions, I'm going to turn it over to Steve Hilmes for the Eagle 21 presentation.

MR. HILMES: Good afternoon. Steven Hilmes. I'll be discussing the testing we preformed for Eagle 21 to demonstrate unit directional communications.

Each of the Eagle racks itself is divided into a loop calculation processor sub-system which performs the safety-related functions and test sequence processor section which performs the non-safety-related, and also handles the communications with our integrated computer system.

VICE CHAIR BLEY: Is it possible to use the mouse, Steve? We want to pick you up on the record.

MR. HILMES: Sure. So the unit directional communications is ensured in Eagle 21 by removal of the receive integrated circuit from the -- in the safety-related section and the removal of the transmit integrated circuits in the non-safety-related sections.

The testing we performed, basically what we did is we did a targeted injection or a data storm into the interface that's normally connected to ICS. We then validated that we had no communications coming out of the interface card that went to the internal data bus. We also validated at this point on the safety-related portion that we had no data coming in. And then we validated that while we were injecting the data storm in that Eagle 21, the safety-related section, continued to broadcast information out, actually out into the connection going to ICS, and we monitored with a computer to validate it was not interrupted, which is really what's beyond what's required, but it demonstrates that there is no impact at all by that data storm coming in.

Any other questions?

(No audible response)

MR. HILMES: I'll turn it --

MEMBER BROWN: No, I was just going to make one observation for those who weren't at the meeting. The fact that they removed the chips from the critical cards, that is part -- that's under the configuration control.

MR. HILMES: That is correct.

MEMBER BROWN: I remember I did ask that and you all said yes. So it's explicitly specified on the drawing so that you cannot -- or on whatever configuration control documents so that they get the right stuff installed, which is a critical point for this one. That's all I had.

MEMBER RAY: So somebody doesn't come along and think something's missing and stick it in.

(Laughter)

MR. HILMES: No.

MEMBER BROWN: It's kind of hard to do, I think.

MR. HILMES: It is. The cards are configured by Westinghouse. We do validate the cards, meet the drawings before we insert them.

If you're done with questions on that, I'll turn it over to Mr. Frank Koontz.

MR. KOONTZ: Thanks, Steve. Gordon, next slide. The next slide is on fuel pellet thermal conductivity degradation is a function of burnout. To give the Full Committee and update on this topic, this is where we are in Watts Bar Unit 2. Our original Watts Bar Unit 2 large break loss of coolant accident was based on the Westinghouse Safety Analysis Codes. In particular, they used ASTRUM, which is their best estimate LOCA code, and PAD4, which is their fuel rod performance code. That gave us a peak clad temperature for Watts Bar of 1,552 degrees Fahrenheit.

The NRC issued several communiques with respect to thermal conductivity degradation. In particular, they had an Information Notice 2009-23 and 2011-21 that cautioned the vendors about the use of realistic LOCA models with older fuel rod performance codes that did not incorporate the impact of thermal conductivity degradation. One of the information notices specifically mentioned ASTRUM and PAD, which are the codes we used.

So Westinghouse undertook some studies in the Pressurized Water Reactor Owners Group, and in the study Watts Bar, which was somewhat of a generic grouping study. But Watts Bar was analyzed with some other plants and they came out with an impact that resulted in peak clad temperature of 1,727 degrees. So went from 1,552 to 1,727.

Based on that Watts Bar requested Westinghouse to perform a specific Unit 2 reanalysis for our use in licensing of Watts Bar Unit 2. That analysis used ASTRUM and a special version of PAD4 that incorporated thermal conductivity degradation. So our new analysis of record becomes 1,766 degrees Fahrenheit. As you can see, we still have margin to the 2,220 degrees Fahrenheit. The NRC audited that approach. And in fact, they ran FRAPCON 3.5 to do their own studies, and they approved the results for the first operating cycle. They will probably add a license condition for Watts Bar Unit 2 that says we'll have to reanalyze the large break LOCA once the PAD5, which is the new model that incorporates TCD for Westinghouse, is approved by the NRC.

Any questions on TCD?

MEMBER REMPE: What's the date for that PAD5 to be --

(Simultaneous speaking)

MR. KOONTZ: PAD5 is in review at the NRC now. The last time I checked Westinghouse thought it might be approved by September of this year. So that should give us time to do the reanalysis if required.

MEMBER BROWN: Is that required to do that reanalysis in order to complete all your other critical testing and things like that?

MR. KOONTZ: No. I mean, this will be a reanalysis sometime during the first cycle of operation. It will be low burnup for the first cycle. We do have a lot of margin on PCT, so it should not be an issue for the first cycle.

MEMBER BROWN: Okay. Thank you.

MR. KOONTZ: If there's no more questions, we'll go on to GDC 5, General Design Criteria 5. To refresh everybody's memory, this is associated with the sharing of safety-related systems. In particular, it says that you need to be able to show you can safely shutdown an accident unit and bring the second unit down to a cold safe shutdown condition. There's no time really specified in the regulation. We did look at this for Watts Bar.

Watts Bar was designed as a hot standby plant, meaning that if you have one unit in an accident, the second unit can sit there in hot standby at approximately 350 degrees using aux feedwater and steam generator cooling while you handle the accident unit. The second unit can then be added on later in the event to cool it down and bring it to cold shutdown.

What we are able to show is that the non-accident unit can be brought to cold shutdown within approximately 72 hours. We picked the 72 hours just based on consistency with Appendix R requirements. The limitation is though that the non-accident unit remains in hot standby for approximately 48 hours. That allows the decay heat to subside on that unit. As I mentioned, we use aux feedwater to cool it. If the non-accident unit is already on RHR, it's coming down for an outage and you have a LOCA in the other unit, then it may be necessary for us to return that unit to hot standby until it has its 48-hour cool-down period.

The NRC has approved the above approach. We do have one open item remaining with the NRC, and that's this return to mode 3. We've submitted a tech spec revision to allow that to happen, and that's under review at the NRC at this time.

CHAIRMAN STETKAR: Frank, I missed the Subcommittee meeting. Is the need to go back up to hot standby ERCW --

(Simultaneous speaking)

MR. KOONTZ: It's really a combination of component cooling and ERCW.

CHAIRMAN STETKAR: Okay.

MR. KOONTZ: If you solve -- get more flow in component cooling, then it's more load on ERCW. So it's kind of a combined event.

CHAIRMAN STETKAR: Thank you.

MR. KOONTZ: No more questions on that, we'll move to the containment sump. Just an update on where we are in containment sump, we've designed our containment sump similar to Unit 1. It's an AREVA stacked disc design. Our Unit 2 containment has low fiber. We've banned min-K and we've banned some of the 3M fire products from our containment. Our analyses that we went through to demonstrate the effectiveness of the strainer included the debris generation and transport calculations, strainer head loss, chemical effects, which we used the Westinghouse-approved methodology for. Downstream effects, we also used the Westinghouse-approved methodology. We looked at orifice erosion as a function of time. We looked at pumps, valves and fuel to see what the impacts were on that. We used the LOCA deposition model, which was to look at the fiber impacts on the fuel, and that was acceptable.

We are in the final implementation stage on the sump. We've got to account for the final coating mass in containment is as-constructed, make sure it's within our design calculations. We do a final walkdown for latent debris and cleanliness to assure it's within what we allowed for in the design. And then we need to complete the installation of the strainer modules.

Now there was a question at the Subcommittee on tapes, tags and labels and the history of that, and I put in a separate slide here on that. Our original sump screen was designed for 1,000 square feet of unqualified tapes, tags and labels. We just put that in the design right up front. We ran a 3-D computational model which conservatively predicted that tapes, tags and labels could transport towards the sump screens.

The NRC issued guidelines for how to go do testing and one of the tests that we did was a special test that looked at reflecting metallic insulation and the crumples from that and tapes, tags and labels to see if any transport occurred that was significant. What we found is that we did not see significant transport of those materials.

Our final sump test incorporated that, and we conservatively added to the final test a 200-square-foot sacrificial area for miscellaneous debris. So we blocked off part of the screens to allow for that. That methodology was approved by the NRC in SSER 27, and they did witness some of the testing.

Any questions on sump?

(No audible response)

MR. KOONTZ: If not, I'll turn it over to Gary Mauldin.

MEMBER RAY: Wait.

MR. KOONTZ: Yes, sir?

MEMBER RAY: I have a question on something else.

MR. KOONTZ: Sure.

MEMBER RAY: It took a while to percolate about it. Let's go back to slide 8.

MR. KOONTZ: Okay.

MEMBER RAY: And I listened to what you said and then I was trying to correlate it precisely with the slide here. If an non-accident unit is already on RHR in less than 48 hours, it may be necessary to return to hot standby. Describe a circumstance in which you would go onto RHR in less than 48 hours under these circumstances and then find yourself because of the other unit's needs having to go back into hot standby with that non-accident unit.

MR. KOONTZ: Well, this was kind of a question from the staff that we took a look at. What they were concerned about is if you started to go into a refueling outage and you started to cool down your unit to go into refueling outage. First you go into mode 3 and you steam off the steam generators. And then you proceed on as it cools down you may wish to go onto RHR and continue the cool-down to mode 5. They conjectured that what happens if you had a LOCA in the other unit at that time and you had just gotten to RHR --

MEMBER RAY: Okay. I got it. So it's a coincidence?

MR. KOONTZ: A coincidence of a LOCA and refueling.

MEMBER RAY: It isn't that you deliberately went on RHR --

MR. KOONTZ: No.

MEMBER RAY: -- in less than 48 hours --

MR. KOONTZ: That's right.

MEMBER RAY: -- thinking that you for some reason weren't going to have to reverse and go back again?

MR. KOONTZ: That's correct.

MEMBER RAY: It's a coincidental event?

MR. KOONTZ: Yes.

MEMBER RAY: Okay.

MR. KOONTZ: They were worried about that, so we looked at that and that's where we came up with this.

MEMBER RAY: All right.

MR. MAULDIN: So if there are no more questions, I'll proceed forward. My name is Gary Mauldin. I'm the Vice President of Nuclear Projects for TVA. I'm on slide No. 11.

So, today I'll be discussing mitigation of extreme flooding events. That would be probable maximum flood, PMF, for Watts Bar Unit 2. I'd start by saying we've done a substantial amount of work with NRC staff and appreciate the extra effort that they've had to put in to support our new approach.

MEMBER RAY: And I want to draw attention to your last bullet on this slide. There's a new piece of information that's important for everybody to have in mind as we listen to you.

MR. MAULDIN: Thank you very much. And I will start with the current status. So we've finished a complete new hydraulic model of the Tennessee River and its tributaries using HEC-RAS, which is the industry standard hydraulic modeling tool developed by the Corps of Engineers. All dams that we've credited in our PMF scenario are confirmed to be stable or are in process of being modified to be stable using current industry standards. Those modifications are on schedule to complete by fuel load at Watts Bar Unit 2. The structure systems and components required for flood mode operation at Watts Bar are protected or designed for submergence. And as was mentioned, the Unit 1 license amendment was approved by NRC on January the 28th.

Next slide, please. So to achieve those results we made two significant changes in approach. First we converted to HEC-RAS as I mentioned. And second, we adopted the TVA River Operations Dam Stability Guidelines.

So TVA owns the dams in the Tennessee Valley. As a part of that there's an independent oversight group, Dam Safety, that was established by the board of directors when we committed to following the federal guideline for dam safety. So that's what I'm referring to here.

So once we made these changes, we ran the HEC-RAS model, determined what the new PMF levels would be. Based on the new PMF levels we then analyzed dam stability using the River Operations Guidelines. Those guidelines are current industry standards. They're based on FERC and Corps of Engineers similar guidelines.

Once we did the stability analysis, we determined which if the dams we could rely on to be stable. Then we determined which dams could be modified in a reasonable period of time to be stable under those new criteria. That resulted in substantial modifications to five dams, which I will go over in just a minute, and, because not all the dams could be shown to be stable, we postulated failure of four additional dams in the system using very conservative assumptions in the model to do that.

Move on to the next slide, please. So this is the list of the modifications I just mentioned. They're significant modifications. They include post-tensioning to bedrock, raising elevation of embankments and removing of the HESCO barriers. And I would note that these are substantial dams. They're in excess of 100 feet to just over 200 feet. So these are large structures. These are not small dams.

Next slide, please. So in summary, using the new hydraulic model and making the modifications we achieved a new design basis elevation of 739.2 feet for Watts Bar. And as mentioned before, that is of course applicable to Watts Bar 1 and Watts Bar 2.

The advantages to using this approach is rather than relying on the original stability calculations from the 1940s, we're aligned with current industry standards. We made very conservative assumptions when we did the model to ensure that the results are bounded from a safety perspective. This provides the licensing basis. The Unit 1 LAR provides the licensing basis for Unit 2. It supports our Fukushima analysis going forward. Our hydraulic model is the same. The modifications we did considered Fukushima requirements when we did those modifications when it was feasible to do that.

And as I mentioned, another benefit, because TVA owns the dams, as we modified them to support our effort, those dams now meet all dam safety stability criteria, so it supports the larger TVA Enterprise Dam Safety Program.

And that's the end of my report pending any questions.

MEMBER SKILLMAN: Gary, let me remind myself at least, there was one dam where you were completing the roadway and relocating a bridge. And I'm wondering if that construction contradicts what you said about having all of the dams remediated prior to fuel load.

MR. MAULDIN: No, sir, it does not. So specifically, the new road construction that is going on is a new bridge being built just downstream of the current dam. The current dam has a bridge over the top of the dam. So what's being done is replace that bridge with a completely structure. They do tie in on one side. The road ties in on one side. The interference that you remember, the previous discussion, was we had to keep some of the HESCO barriers there.

The HESCO barriers that are being interfered with, we would have to close the road, and that would mean closing the bridge. Because of the existing construction we can't remove those HESCOs without closing the bridge, and that creates a number of issues, as you would suspect, getting across the bridge or you got to go a long way to get back across the river right there. So, no, it does not impact that because the new road construction is not on the dam. We are remediating that dam. We are doing some post-tensioning and pinning work at that dam.

MEMBER SKILLMAN: Okay. Thank you.

MEMBER RICCARDELLA: Do the dam stability calculations include seismic analysis?

MR. MAULDIN: We did not redo our seismic analysis as part of the new amendment that we sent in.

MEMBER RAY: Which was now proved?

MR. MAULDIN: That's correct.

MEMBER RAY: The one licensing basis.

MR. MAULDIN: That's correct.

MEMBER RICCARDELLA: But will you be doing that as part of the Fukushima response?

MR. MAULDIN: We are updating all of our seismic to the new CEUS different return period, etcetera as part of the 2.1 submittal that we're making in March. Yes, sir.

MEMBER BROWN: And there are no differences associated with Unit 2 with regard to this license amendment request that's been approved.

MR. MAULDIN: That's correct.

MEMBER BROWN: In other words, it's a site consideration and takes into account I presume then what is still underway to be done before Unit 2 start-up?

MR. MAULDIN: Yes, sir, you're correct.

MEMBER RAY: Thank you.

MR. MAULDIN: So with no other questions, I'll turn it over to Mike Bottorff.

MR. BOTTORFF: Yes, good afternoon. I'm Michael Bottorff, the senior license holder at Watts Bar. I appreciate the opportunity to discuss our Appendix R fire protection, our response and the reliability of our operator manual actions.

Our operator manual actions are evaluated according to the guidelines in Regulatory Guide 1.189, as well as NUREG-1852. Our timelines and methods considered the following: Fire detection;, condition diagnosis, personnel assembly, communications, as well as some of the others listed here.

Next slide, please. This slide depicts our command and control for a fire response. Some of the positions I'd like to specifically address are the shift manager at the top. He does retain overall command and control and final decisions on all actions. Everything is reported back up to the shift manager.

Off to the side you see the incident commander and the fire brigade leader. The incident commander is a licensed senior reactor operator who is dispatched to any scene. They set up a command post with the fire brigade leader. The incident commander is responsible for plant safety and communicating plant effects to the shift manager back in the main control room. So if a decision has to be made to trip the reactor or turn off equipment or de-energize boards, that is from the incident commander back to the main control room.

The fire brigade leader is in direct command and control with the fire brigade. The fire brigade is a dedicated fire brigade whose sole action is to combat the fire. They are not part of the operators who take operator manual actions. Their sole response is to the fire and mitigating the fire damage.

The unit supervisors for each of the teams, they will analyze the plant based on the alarm that came in or the indications that they are seeing, and they will perform the diagnostics of whether a plant fire requires an Appendix R fire determination.

The control room operators, there are four of them, two of them dedicated to each unit. Their job, one of them is the operator at the control who will help in the diagnostics of the plant and controlling the plant, taking actions. The other operator will assist in briefing the auxiliary unit operators who report to the main control room once we have a plant fire determination.

It does not have to become an Appendix R. As soon as we have a plant fire alarm and a response, those operators are recalled to the main control room and then they are briefed based on the fire location, their actions that they take based on the priority of who gets there first and the location of the fire.

Next slide, please. Yes, sir?

CHAIRMAN STETKAR: Again, I have to apologize. I obviously missed the January Subcommittee meeting. The incident commander is listed as an SRO.

MR. BOTTPOOLORFF: Yes, sir.

CHAIRMAN STETKAR: And I'm trying to do a body count here. The shift manager is an SRO. The unit supervisors are each SROs. Where does this incident commander SRO live during normal full-power operation? What's his role normally?

MR. BOTTORFF: Yes, sir, I understand. The incident commander's normal position, first he is a dedicated on our -- for each shift it is an incident commander assigned to that shift. And he can have other duties when not relied upon for response such as in work control with normal work orders, briefing operators on maintenance, things to that effect for being a field operator. I'll have a --

(Simultaneous speaking)

CHAIRMAN STETKAR: So normally a shift manager and you'll actually -- I don't know whether your STAs are SRO-qualified.

MR. BOTTORFF: Yes, sir. All of our STAs are SROs.

CHAIRMAN STETKAR: But if I do my body count, then you'd have five SROs between the two units on shift 24/7?

MR. BOTTORFF: Yes, that is correct?

CHAIRMAN STETKAR: Okay. Thank you.

MR. BOTTORFF: For our fire protection --

MEMBER RAY: As is the dedicated fire fighting team?

MR. BOTTORFF: Yes, sir, that's completely dedicated. And that's for each shift as well.

For our fire detection we have over 1,500 detectors specifically throughout the plant for our fire operating response if it has to do with safe shutdown. They're diverse detectors and they're placed throughout the plant based on the equipment, the plant location, and that assures us the best detection of a fire or prevention of fire growth.

Our detectors are lined up in two

different ways throughout the plant with cross-zone detection. There's 241 cross-zones throughout the plant. And for a cross-zone it's basically coincidence or an "and"-type logic. And for single-zone detection that does initiate an alarm in the main control room, as well as our fire operations. And then we back that up with operator action. They are dispatched to the location for a visual confirmation. And our delay times are accounted for once we get that alarm.

We also have fire being able to report by plant personnel -- we have throughout the plant continuously radiation protection -- operators, fire operators, security and chemistry techs. So throughout the plant on a 24-hour-a-day basis there are plant personnel continuously roving the spaces and back that up with a single-zone detection, if required.

Next slide, please. This slide shows our defense-in-depth protection against two specific type fire scenarios. The first one is a slow, undetected fire. Our defense-in-depth includes operators in the field, as I mentioned, smoke and heat detectors, as well as spurious indications that would be observed in the main control room.

Some of our admin controls. Our combustible loading program, both permanent and transient. And we have fire ops personnel who perform weekly inspections where they walk down every area of the site looking for transient and permanent combustibles. We do require hot work permits and fire watches for any type of hot work that would occur in the plant. We do meet National Fire Protection Association Code-compliant detection and suppression. And we meet equipment separation requirements in accordance with the Reg Guide.

With all of those combined defense-in-depth, it's very highly unlikely -- that, and combined with our training, that we would have a slow undetected fire that would result in an Appendix R fire situation.

The other type of scenario is a rapid fire. There's no condition which would result in immediate need to declare an Appendix R event. Should we have something occur, it would only be a single train affected based on our equipment separation requirements. This would only occur where there's accelerant present; for example, oil-filled transformers. Currently there's only five locations throughout the plant that this could occur, which is our shutdown board rooms and our intake pumping station. For those locations if we determine that there's an Appendix R fire, the first required action is within one hour. Our operators are recalled within three to eight minutes. There is more than enough time to brief them and have them perform those actions.

Next slide, please. We have discussed the response previously, but I want to mention again the pre-brief for the operators and the times on this slide specifically.

Once the main control room receives a report of an alarm or we have diagnosed that I have a fire, the unit supervisors will enter an abnormal operating instruction, which for us is Abnormal Operation Instructions 30.1, "Plant Fires." The fire brigade will be dispatched. That alarm is also heard in the fire ops, so that they begin going without our report from the main control room.

We do initiate personnel assembly right then. The operators are called to the main control room. And as you see below, the first auxiliary unit operator was available within three minutes, the second available in five minutes, and all others within eight minutes. And the eight minutes takes into account our intake pumping station, which the furthest place in the location that we allow Appendix R operators to go while still holding that position.

Once we've initiated that assembly, the unit operators that were on the previous page, they will brief the auxiliary unit operators based on the fire location on their actions that they will take, will verify that fire pumps are running and we will continuously evaluate for an Appendix R fire based on the main control room indications. If we do determine that there's an Appendix R fire based on our indications, those operators that were pre-briefed will be dispatched immediately.

To discuss the feasibility of our operator times, the Appendix R requirements for us start when we trip the reactor as a repeatable time. For all the crews when we do drills, when we have anything going on, that's when we start our stopwatch for time zero. The first auxiliary unit operator available performs the operator actions with the shortest amount of time. So the first one that reports to the main control room will be briefed on the specific action with the shortest amount of time. Those actions are prioritized based on when they respond.

The operator actions allowed times do

include transit from the main control room or the auxiliary control room and the time to perform the actions. The operator manual actions are proceduralized and they do not require a diagnostic time, so the operators, once they get to their location, they do not have to perform diagnostics. It's based on the fire location, the indications that I saw on the main control room.

They're pre-briefed. They go to their location and they take their actions. The operator manual action performance times have been demonstrated repeatedly from walkdowns from the main control room, and we have validated those by various drill performances. The feasibility and reliability of our evaluations are accounted for -- they do account for environmental conditions, which are discussed on the next slide.

Our environmental conditions were analyzed in accordance with NUREG-1852, and I'd like to discuss a few of those here.

The lighting both on the transit path to the location will -- they will take their action and the location where they have to perform operator manual actions are all lit.

Smoke. There are no short-term operator

actions in the fire area. Large rooms do provide a smoke buffer. And specific fire plans potentially affected by smoke are taken into account, such as the way that we route hoses if I have doors that are open. Ventilation is discussed in those fire plans. And fire dampers and doors are also discussed.

For radiation there are no operator manual actions in high-radiation zones and there are no short-term actions that require the operators to dress-out once they enter those areas.

There is no impact from noise since once again the operator manual actions are proceduralized. They're pre-briefed. There's not a lot of required communication as they transit to their area. The radio communications are minimized. The actions are pre-briefed and the operators are trained. And they continuously practice these actions on a routine basis in our training program.

Sprinklers, temperature, humidity and proper personnel protective equipment were accounted for in our timing, such as donning self-contained breathing apparatus or the personnel in construction on their way to the action locations. All of our environmental conditions were accounted for with a factor of two margin.

MEMBER SCHULTZ: What does that mean, Mike, in terms of a factor of two margin? Could you give a couple of examples of that?

MR. BOTTORFF: Yes, sir. So for all the times we were able to meet it with -- we say 100 percent margin or a 50 percent margin, if the action requires 60 minutes to be completed, we can complete that action in 30 minutes. If it's 25 minutes -- I picked a bad number -- 20 minutes, we can complete it in 10.

MEMBER SKILLMAN: Is the margin applied only to the time? Is margin applied to temperature or to --

(Simultaneous speaking)

MR. BOTTORFF: Yes, sir, that margin takes into account all of those, whether it's the temperature where the operator action is located, the PPE required to get to that action -- so they may have to put on a self-contained breathing apparatus. They may have to don that. That's taken into account. If they have to go to an area that's potentially contaminated, the dress-out is taken into account. Each of the area locations and the environmental considerations are taken into account with that time, and we still have a margin of two, or a 100 percent margin, or we meet 50 percent of the time.

MEMBER SKILLMAN: Okay. So the margin is really a time margin given the conditions that will be encountered --

MR. BOTTORFF: Yes, sir.

MEMBER SKILLMAN: -- at the location?

MR. BOTTORFF: That is correct.

MEMBER SKILLMAN: Understand. Thank you.

CHAIRMAN STETKAR: Mike?

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: Let me -- and again, I apologize. I wasn't here in January in order to ask more details about this, but my introduction to this was reading through the detailed fire hazards analysis. A few descriptions there kind of triggered my questions about this timing and feasibility analysis, and I'll just highlight one.

Fire in room 772.0-A15 West. The summary that I have here in front of me; and I again apologize because this is from June of 2013, so it's a little old in both my mind and whatever --

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: -- says that 13 actions in Unit 2 are required by four AUOs and six Unit 1 or dual-unit actions are performed by three AUOs. So

I've got seven people. The first action that seems to be identified says that one AUO must transfer control of the auxiliary feedwater pumps within 20 minutes after the reactor is tripped. So if I take your timeline, I'll take 20 minutes, I'll take the first guy in the control room, so that's minus 3. So I've got 17 minutes left, plus or minus some uncertainty.

And now you're going to tell me that you have a factor of 2 over the remaining 17 minutes. Given the fact that I've got the main control room giving dispatch orders to as many as seven different operators to go to some complement of a large number of locations --

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: -- it's surprising that you can pull that off.

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: So I'd like to know how you've actually done that other than talking to people and saying, yes, indeed, we can under clean conditions walk from point A to point B within six-and-a-half minutes, so I get a factor of two.

MR. BOTTORFF: Yes, sir. So we have demonstrated even for the NRC a walk-through with one of the highest PRA risks for the plant, but we have taken all of our actions and we've taken the minimized time.

So to address your scenario, the operators are recalled to the main control room at the beginning of a fire.

CHAIRMAN STETKAR: Right. And they come in at varying times, as you noted.

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: And --

MR. BOTTORFF: And the first one then would be briefed based on that shortest action. And I do have extra operators on the Unit 2 or Unit 1 side, depending on which unit is dispatching the operators, that would come over and aid in the briefing. Those operators are pre-briefed or briefed at that time and based on the shortest amount of time.

That auxiliary unit operator will then proceed out of the main control room. He'll enter our auxiliary building. And there's basically an emergency entry where there's no time requirement. He's handed his personal -- his dosimetry, handed it as he goes in. They record the time so that we don't lose that. He proceeds straight into the auxiliary building. He walks down one flight of stairs, walks over and turns a switch based on his pre-brief, and then reports to the main control room that that action was taken. And on consistency and repeatability time we have met that 50 percent margin, sir.

CHAIRMAN STETKAR: You just talked about one and only one person doing one and only one task.

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: Remember, I told you that there are seven people being dispatched to a large number of locations in two units --

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: -- while all of this is going on. It's nice to talk about one individual doing one focused task. I'm talking about a situation where there's a fire going on and there are many people saying what do I do now and the people in the control room are trying to figure out what they ought to do. And it's not as clean as what I hear you telling me in the real world, and we have experience from the real world.

So then I'm curious on a 20-minute time window how you get your factor of 2 margin. What uncertainties are there in those times and how have you accounted for those uncertainties?

MR. BOTTORFF: The uncertainties taken into account, sir, are the location, the radiation, smoke, and more importantly for the short times is the PPE required, the personal protective equipment that those operators are going to have to put on to get in the location.

In the main control room, as you say, yes, sir, we do have -- it's very proceduralized based on the fire location for which actions are going to be required first and then which operator responds first. That operator is based on the priority of the action and the time. I do have multiple operators that brief the auxiliary unit operators who are going to be taking out their actions. And it is proceduralized based on the location.

CHAIRMAN STETKAR: Well, now you told me you have a balance-of-plant operator probably that helps out during that. That's what you told me earlier.

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: Okay. That's not multiple operators briefing people. That's --

MR. BOTTORFF: From each unit, sir.

CHAIRMAN STETKAR: -- like one guy.

MR. BOTTORFF: I do have another balance-of-the-plant operator on the other unit.

CHAIRMAN STETKAR: And they know precisely what each other is saying to these seven people being distributed through both units?

MR. BOTTORFF: Yes, sir, because it's a coordinated effort on the brief. And of those seven some are grouped. There are four that respond in one group. They require the same brief, sir.

CHAIRMAN STETKAR: I'm skeptical that it's going to work that cleanly in the real world.

MR. BOTTORFF: Yes, sir. I understand.

For our communications, we do have two physically separated radio systems. Those have been tested assuming a fire-related damage so that I have a backup if the primary were to fail. We have verified that I have radio communication for all our operator actions in the locations. And all of our auxiliary unit operators do carry radios.

We have completed several fire response demonstrations. One of the most recent was for the NRC. They selected the location based on a high PRA risk to the plant. It was a dual-unit demonstration, so the fire affected both units, and we were able to demonstrate the effective coordination between the main control room and the AUOs, which was the group that we just discussed with using the operators that are available in the main control room, not the operators at the control. And we were able to validate that those operators were briefed and could take out their action and meet the performance times in the NUREG-1852 with the times two or 50 percent time margin.

In summary, our fire protection defense-in-depth includes a robust detection system, administrative controls, trained operators and equipment separation, which will aid and preclude fire development. We have a strong command and control team. The main control room staff is proficient. We conduct training every five weeks in the simulator. We also have job performance measures where the auxiliary unit operators walk down their operator manual actions, and we conduct fire drills quarterly where each of the five shifts of the fire brigade respond for the fire actions.

We have shown a rapid response to the fire condition. The staff, as I said, are proficient, highly trained and qualified. Our operator manual actions are in accordance with NUREG-1852 and we do meet the environmental conditions. Our Appendix R response ensures safe shutdown can be achieved and maintained. And Watts Bar's Fire Protection Program will support dual-unit operation.

Pending questions, I turn it back over to Paul Simmons, page 24.

MR. SIMMONS: Any other questions?

(No audible response)

MR. SIMMONS: Mr. Chairman, that completes our presentation for today. We appreciate the opportunity to present the status of the Watts Bar Unit 2 project. We are committed to completing this project in a manner that supports safety and high quality, and we are prepared to operate this plant and maintain it in a way that supports a safe and reliable commercial operation.

And with that, I'll open it up for any questions that the Board may have for us.

MEMBER RAY: You're going to stand by, I trust, during the staff presentation. So we may have questions then as well. And perhaps you'll have someone available when we write the letter, but that's up to you.

If there's nothing else, we'll ask the staff to make their presentation at this time.

Justin, please be sure and touch on the matter we had a little discussion about having to do with the pending tech spec and the return to standby in the event you're in a refueling outage when the other unit has an accident.

MR. POOLE: All right. Good afternoon, everyone. I just wanted to start off our presentation; next slide, please, to touch on lightly what was discussed in the previous Full Committee. So as mentioned earlier, we last met with the ACRS Full Committee in November of 2013. In that meeting the staff laid out the history or the background of the project showing a timeline of the different milestones of the project leading up to Unit 1 getting its operating license in 1966.

The staff then described how the scope of the review was defined from the Commission direction in SRM 07-0096 to the creation of office-level documents, both regarding the licensing review and how the Construction Inspection Program would be laid out.

The staff then provided a status of what had been reviewed by the staff up to date, highlighting some of the challenges it had come across during that time, and then moved on to describe the remaining activities before the staff.

Finally, Bog Haag, the Region II branch chief, who you'll hear from later, provided a similar discussion regarding inspection status at that time.

As was mentioned earlier, following the

Full Committee meeting the Full Committee issued its interim letter which described eight open items for the staff to present back to the ACRS. Staff met with the Subcommittee on January 13th and described how those open items were closed out. And my following slides we'll be presenting here to the Fuel Committee on those same topics.

Next slide, please. In SSER 24 the staff had previously documented its review of changes to Section 2.4.10, "Flood Protection," due to a change in the probable maximum flood level. In that SSER the staff had identified two open items, Open Items 133 and 134 that you see on the screen.

Open Item 133 had looked to confirm the stability of sand baskets or the HESCO barriers during a seismic event. In subsequent correspondence with TVA, TVA was able to show that the flood heights for the half-PMF event and the 25-year flood did not over-top the current earthen embankments at those dams where the HESCOs were positioned, and therefore the HESCO barriers were not needed when considering an SSE plus 25-year flood or an OBE plus half-PMF event, and that the additional height was only required during a full-PMF event. In addition, as you heard from TVA earlier, a large majority of the permit modifications for placing the HESCO barriers will be in place prior to the current date for the operating license for Unit 2. So based on those two things, the staff closed in SSER 27 Open Item 133.

Open Item 134 dealt more with the overall hydrology review. So again, that was published in SSER 24. And following the ACRS Subcommittee meeting in 2011 where there were a number of questions raised during that meeting, additional work was done by both TVA and the staff related to the probable maximum flood seen at the site as part of its design basis.

Since the need to update the probable maximum flood originated from the deficiency identified in TVA's calculations currently being used at the operating fleet, or at that time for the operating fleet, it was determined that the deficiency should first be corrected for the operating unit through the submittal of a license amendment rather than through the review of Watts Bar Unit 2. So as mentioned earlier, TVA submitted the license amendment for Unit 1 in 2012 with the staff issuing its approval of that license amendment on January 28th of this year.

During the course of the review, in order to address concerns from the staff on dam stability, TVA's submittal was modified, as you heard from TVA earlier, which had originally relied on older codes and standards to being based on more widely accepted codes and standards such as the use of HEC-RAS and FERC dam stability criteria.

Now if the deficiency in the operating unit's licensing -- I'm sorry, the design basis has been corrected, and since the operating unit in Watts Bar Unit 2 are collocated and share both facilities and equipment, the resulting probable maximum flood for Unit 1 is the same as the probable maximum flood for Unit 2. TVA has updated the Watts Bar Unit 2 FSAR to match the FSAR pages that were provided as part of the Unit LER. Per the Commission SRM Unit 2 will have the same licensing basis as Unit 1.

Although the timing of the staff completing its review of Watts Bar Unit 1 did not support or line up with the timing of the publication of SSER 27, the staff was able to share its findings at the Subcommittee meeting in January and plans to close Open Item 134 in SSER 28.

Next slide, please. In the November ACRS interim letter ACRS has requested that the staff explain how the feasibility of all operator manual actions taken in response to a fire is evaluated in accordance with the guidance in Reg Guide 1.189, Rev 2; in particular, how the timeline methodologies outlined in NUREG-1852 are used to evaluate times for fire detection, condition diagnosis, personal assembly, communications coordination, supervisory direction, transit and implementation of the required actions, including an assessment of the associated uncertainties and available time margins.

Since the November interim letter, TVA has supplied the staff through public meetings and on the docket in the form of updated sections to the fire protection report it presented to the Subcommittee in January and what you just heard earlier today. TVA stated upon completion of confirmation of a fire such as actuation across zone fire detection, Co2 fire extinguishing system actuation or plant staff observation steps are initiated that include recalling auxiliary unit operators needed to perform OMAs to their assembled locations.

TVA performed recall exercises and determined that the first auxiliary operators are available within about three minutes, as you heard in their presentation. In the event that an Appendix R event coincides with a plant trip without prior detection or recall the first auxiliary operators, there is still available margin for the most time critical manual actions to be performed. This is based on the 100 percent available margin for the manual operator actions and no manual operator action time is needed in less than 10 minutes.

In reviewing this information as well as the staff's review of the Watts Bar Fire Protection Program the staff believes that the Unit 2 OMAs have taken the appropriate factors into account and that adequate time margin exists in all cases for these uncertainties.

MEMBER SCHULTZ: Justin, was that then an observed exercise or demonstration, that NRC staff was available to observe the demonstration provided by TVA on the dual-unit exercise, or is that going to be covered in the inspection activity later?

MR. POOLE: The dual-unit exercise was observed by the NRC, yes.

MR. HAAG: We did have inspectors from Region II in the Fire Protection Area actually watching that demonstration.

MR. POOLE: I actually happened to be there that day and I ended up watching.

MEMBER SCHULTZ: Could you then describe it in a little more detail? I understand the three minute part, but beyond that when we say that there's 100 percent margin that's demonstrated in an exercise, what does that look like in terms of getting the entire crew to location or --

MR. POOLE: So the dual-unit exercise that was witnessed that Bob mentioned the NRC staff was there in attendance for wasn't necessarily the timing -- the recall timing exercise that TVA did to show that everyone could come back -- you know, that the first operator would come back in three minutes, the second came back in five and eight, and so on and so forth. There may have been NRC inspectors that witnessed that. I'm not sure.

What we were talking about was the dual-unit exercise that was performed at the site, and that was just given that certain fire scenario they stepped through their procedures as if it was a live fire. The fire alarms went off, the personnel was recalled back to the recommend. Or I believe they actually had a -- TVA may be able to help us with the actual setup of it. There was people came to the actual control room for part of the timings. They also had --

MR. BOTTORFF: Yes, sir.

MR. POOLE: -- in order not to interfere with the operating unit they had an aux control room set up where some of the orders were given out as well.

MR. BOTTORFF: Yes, sir. The scenario was developed. The main control room was actually in the simulator for the operators --

MEMBER RAY: Just again identify yourself, please.

MR. BOTTORFF: I'm sorry. Michael Bottorff, senior license holder, Watts Bar. That scenario was -- we utilized multiple locations. We used the simulator for the main control room operators so that they had the proper indications. And the auxiliary unit operators though reported to the main control room at the plant. They were briefed and then dispatched to their locations. So that timing was from the time that they were informed. They did report to the main control room. They were briefed and then they were dispatched to their location. And we did have NRC representatives that were in the main control room and they followed the operators out to the location as well. Yes, sir.

CHAIRMAN STETKAR: Okay. And before you step down, you said this was a dual-unit exercise. Good. Was it one of the more -- what I'd characterize as challenging fire scenarios in the fire hazards analysis where you had up to seven or eight AUOs going to several different locations?

MR. BOTTORFF: Yes, sir.

CHAIRMAN STETKAR: It was?

MR. BOTTORFF: We had several groups that were briefed and the NRC selected that based on that the high probability risk assessment on the plant. So it was one of the highest PRA risks for the plant dual-unit and it did require the coordination of several groups of operators to be dispatched. Yes, sir.

CHAIRMAN STETKAR: Okay. Thank you.

MR. POOLE: Thank you. Appreciate that. Okay. The next bullet down is on the Eagle 21 communications, Open Items 63 and 93. So Open Items 63 and 93, as you heard earlier from TVA, dealt with ensuring digital communications to Eagle 21 from outside the system is prohibited and that the two-way communication is not possible. TVA, as you heard earlier, went into great detail as to the setup of the test. The staff here in NRC headquarters was provided their test plan, as well as their test setup and reviewed these documents to see whether TVA was essentially doing an adequate test, whether the test would truly demonstrate whether or not the two-way communication would be possible.

The staff also reviewed the summary of the test results. In addition to the NRR staff, Region II was present and witnessed the test as part of their inspections. In all the staff found the setup to be appropriate and that the results showed that two-way communication cannot occur and the staff closed Open Items 63 and 93 in SSER 27.

Next slide. SSER 23, documented an open item is Section 4.2.2 under the heading of "Thermal Conductivity." In that SSER the staff noted that the thermal conductivity model used by TVA, PAD4.0, does not account for degradation. The open item expressed the need for more information to demonstrate that PAD4.0 can conservatively calculate the fuel temperature and other impacted variables given the lack of fuel thermal conductivity degradation modeled.

As TVA described earlier, TVA's resolution to this open item was to work with its vendor to submit a new PAD fuel performance data using what is being called PAD4TCD, which includes explicit modeling for the thermal conductivity degradation. This model, though not generically approved through say a topical report by the staff, has been used in previous reviews, specifically the Turkey Point EPU.

For the Watts Bar Unit 2 the staff performed a confirmatory analysis similar to what was performed for the Turkey Point EPU, which demonstrated that there was good agreement between PAD4TCD and FRAPCON 3.5 for fuel design planned for Unit 2. Based on the staff's previous review of PAD4TCD done for Turkey Point EPU and the confirmatory analysis performed for Watts Bar Unit 2 fuel, the staff is satisfied that the concerns previously documented in SSER 23 have been addressed and considers Open Item 61 to be closed.

The staff is proposing a license condition associated with the use of PAD4TCD codes such that staff approval is conditional on the initial fuel cycle. A similar license condition was applied in the approval of the Turkey Point EPU.

MEMBER SCHULTZ: And that's not just for PAD? It's also for the PAD applications, the LOCA analysis and so forth to be completed prior to start of cycle 2?

MR. POOLE: I believe it's actually for the use of PAD in combination with the other fuel codes, but I'll ask my --

MR. KAIZER: Josh Kaizer, NRR. Can you restate your question?

MEMBER SCHULTZ: When TVA made their presentation they indicated that what the license condition entailed was performing a LOCA analysis using PAD TCD prior to Unit 2 -- prior to the second cycle of operation.

MR. KAIZER: Okay.

MEMBER SCHULTZ: And I'm concluding that what this means is that you're working with them to make sure that the overall license evaluation incorporates the thermal conductivity degradation, not just a comparison between PAD and FRAPCON.

MR. KAIZER: Correct. I guess to restate; and, TVA, please correct me if I'm wrong, PAD4TCD accounts for thermal conductivity, but it's not approved. So the biggest impact is the LOCA PCT. It would obviously feed into another analysis, but that's the biggest one. We reviewed it. We approved it. And then when they update to PAD5, they'll most likely redo the analysis. And what I'm actually guessing will happen is that they'll determined that PAD4TCD is conservative compared to PAD5. And so they won't necessarily redo the LOCA analysis. They'll say, hey, that PCT we calculated before is actually higher than what we would get. Does that clarify things or --

MEMBER SCHULTZ: Well, you're assuming

what's going to happen. I presume that --

MR. KAIZER: Yes, I mean, we're obviously --

MEMBER SCHULTZ: -- you're really looking for the evaluation to be done.

MR. KAIZER: Yes, we will evaluate it.

MEMBER SCHULTZ: Because you're approving the methodology at some point in time.

MR. KAIZER: Yes, we will be approving PAD5.

MEMBER SCHULTZ: Thank you.

MEMBER BANERJEE: You will be approving PAD5. You're review PAD5 right now.

MR. KAIZER: Correct, we will be -- well, and we are reviewing PAD5. I'm guessing that PAD5 will be approved at some point. My history here tells me that most things get approved. It's just a matter of how many conditions limitations get placed on those things. So if we do find problems, which I don't expect. I'm actually not part of the review. There were be conditions limitations placed on it.

MEMBER BANERJEE: I don't think we need to get into the details related to this, but it's not obvious that everything will happen with the timing needed. So is there a backup plan?

MR. KAIZER: There is a backup plan and most of that is relying on the expertise of Paul Clifford, who's the DSS on the SL for fuels. He was the one that kind of came up with this methodology of running FRAPCON. We tried to put it so far that we believe that PAD5 will be available at that time. If PAD5 isn't available and you do start getting to the second cycle, there are a lot of options and I'm not really sure what option TVA would propose.

MEMBER BANERJEE: So that's still an open question?

MEMBER REMPE: If there's someone from TVA who could perhaps give us their insights.

MR. KOONTZ: Yes, this is Frank Koontz, TVA.

MEMBER BANERJEE: I mean, you're going to put things to much higher burnups, so you need to be careful about that.

MEMBER RAY: TVA would like to --

MR. KOONTZ: Yes, this is Frank Koontz, TVA. I guess what we're planning on is that while it would be a nice outcome if PAD4TCD is approved to be more conservative than PAD5 -- is what we're realistically accounting for is that when PAD5 is approved by the NRC that we would rerun at least limited ASTRUM runs on the large break LOCA to show the peak clad temperature was still acceptable.

MEMBER BANERJEE: And if it was not approved in time for cycle 2, what would you do?

MR. KOONTZ: I guess we'd go back to the NRC and see if we could extend that to cycle 3. The impact of TCD really starts to accumulate more in the later cycles as the burnup increases. It didn't have a large impact according to PAD4TCD, particularly for the first cycle and perhaps also the second cycle.

MEMBER BANERJEE: Okay.

MEMBER RAY: Everybody satisfied?

MEMBER SCHULTZ: Yes, thank you.

MR. POOLE: Okay. Moving on to Open Item 91. In SSER 23 the staff documented the review of the ERCW system. In that review the staff was able to come to the conclusion that the system meets the requirements of GDC 5 by reviewing information that had been provided in an REI response at that time.

In the review staff created Open Item 91 in order for TVA to update the FSAR to include the discussion that had been presented in the REI response. This was to ensure that the requirements of GDC 5 would be taken into account in any future design changes that TVA might make say through the 50.59

process. TVA has since updated the FSAR, not just for ERCW, but component cooling and ultimate heat sink as well.

In taking all these changes into account the staff is satisfied that the wording in the FSAR ensures that the ability to bring the non-accident unit to cold shutdown is now included in the requirements for the system, and as such when making future changes these requirements will be taken into account. Therefore, the staff closed Open Item 91.

As mentioned earlier, during the review of the most recent information presented to the staff related to closure of items, the staff raised the question on the possibility of returning to hot standby in a non-accident unit if less than 48 hours to allow decay heat to subside. Given their proposed tech specs at the time, this mode change would not be allowed. TVA recently submitted its proposal to the staff in the form of updated tech specs and is currently under staff review.

MEMBER RAY: Is that tied in any way to going forward with the OL issuance, or would it be like any other tech spec change that might be made later? It sounds to me like it's something you expect you'll have to resolve before moving ahead.

MR. POOLE: That's correct. So we have the review of the design through the review of the FSAR. And then we have the review of the tech specs which would be issued as part of the operating license. So, yes, this needs to get resolved prior to the issuance of the operating licensing and in our discussions of what would be appropriate tech specs for the system.

MEMBER RAY: Do you foresee any problem at this point, without providing a guarantee as I understand, but --

MR. POOLE: Right. I think, like I said, we recently got this information from TVA. I know we spent some time looking at it. I think at this point we'd say that we do think we're going to have further dialogue with TVA on at least what they've proposed so far and that we're probably going to be looking for a little bit more information than what they've proposed. But we haven't gone into a great detail with TVA on that yet.

MEMBER RAY: All right.

MR. POOLE: Next slide, please. So the last open item was Open Item 59. In SSER 23, Section 6.1.1.4 the staff noted that TVA had modified FSAR Section 6.1.1 to add the following sentence: "Note that qualified coatings inside primary containment located within the zone of influence are assumed to fail for the analysis in the event of a loss of coolant accident. The zone of influence for the qualified coating is identified as a spherical zone with a raise of 10 times the diameter break."

Since this is something that was being looked at as part of the Generic Letter 2004-02 review, or GSI 191, the staff created the open item tying the two items together, meaning that similar assumptions should be made by TV in response to the generic letter and that if found acceptable as part of the review of the generic letter, that these additional words in the FSAR should also be acceptable.

MEMBER BANERJEE: Could I ask a question which is not just related to this open item, but has to do with the cleanliness? I understand that latent debris is being taken as 100 pounds rather than the usual 200 pounds. Is there a condition associated with that somewhere that that sort of cleanliness level is being met? It wasn't clear to me.

MR. POOLE: I believe --

MEMBER BANERJEE: I know that on start-up they have to do an inspection, but it's --

MR. POOLE: Correct.

MEMBER BANERJEE: -- a question of what they have to do on an ongoing basis.

MR. POOLE: I think that was in the staff's SE for Generic Letter 2004-02. One of the conditions did talk to what you just mentioned, the initial inspection of the --

MEMBER BANERJEE: But is there a continuing requirement? Maybe TVA can --

(Simultaneous speaking)

MR. POOLE: Our SE I don't believe identified that, but --

MS. BOTTORFF: Yes, sir. This is Michael Bottorff again, senior license at Watts Bar. Prior to changing modes from either a refueling outage or some outage where I've gone down and gone into containment we had required containment cleanliness walkdowns performed by senior licensed operators as well as senior management to verify cleanliness of containment. Those are all signed off prior to us changing mode.

MEMBER BANERJEE: I'm not sure what that means.

MEMBER RAY: Well, it sounds to me like the standard measure that is required at any plant.

We talked a little bit yesterday, Sanjoy, I think after you were off the phone about the thing that's done before the plant enters service would just entail an enormous amount of radiation exposure if you were to have to repeat that again and again and again during the plant life. So we rely on what he just described as the current state of play.

MEMBER BANERJEE: Because that's a very high cleanliness standard to maintain.

MEMBER RAY: Yes, so a question might be related to this how do we gain confidence that that's maintained over the plant life? A hundred pounds. And do we have some basis for saying, well, it was 100 pounds or less, surely, when the plant entered service and we do perform the kind of checks that TVA just referred to routinely? Is that enough or does that provide the cleanliness that we're relying upon in this case?

MEMBER BANERJEE: Is that a part of the tech specs, or what?

MS. BOTTORFF: It's part of our containment closure, sir, in order to start up and change modes. And not only is it done by the plant supervisor personnel, but the NRC also does a walk-through of containment prior to us changing modes. So that's done every time that we go down for basically a mode 6 where we've de-fueled and we come back up. Or if we have a containment entry, that containment inspection is completed. And it is proceduralized. It's not left up to opinion. It's proceduralized by both the plant and the NRC, sir.

MEMBER BANERJEE: So typically what's the frequency of this happening? Every five years or --

MS. BOTTORFF: It's performed once we go into a mode 4. So if I have a planned outage or every 18 months for a refueling outage, sir.

MEMBER BANERJEE: Oh, okay. That's fine. Thank you.

MR. POOLE: So continuing on, the staff completed its review of the generic letter and issued its closeout on September 18th of 2014. In Section 3.2.8 the coatings evaluation, the assumptions made in the generic letter response matched the statements made in the FSAR; i.e., the qualified coatings within a radius of 10 times the break diameter are assumed to fail, and the staff's generic letter evaluations concluded that TVA appropriately identified the various protective coatings that can be a source of debris inside the containment building following a postulated height break inside containment.

Therefore, TVA's evaluation of coatings is acceptable.

Since the wording added in the FSAR matched what was reviewed and found acceptable during the review of the generic letter, the staff closed Open Item 59 in SSER 27.

No other questions, I'll turn it over to Mr. Bob Haag on construction inspection activities.

MR. HAAG: Good afternoon. As mentioned earlier, I'm Bob Haag. I'm the branch chief in Region II for the responsibility for the Watts Bar Unit 2 Construction Inspection Program.

So what I'd like to do today is go over a little of the development of the inspection program for Watts Bar Unit 2, go over the status of where we're at currently with our inspection efforts, and then talk about items remaining.

So we're continuing with the inspections that are specified in Inspection Manual Chapter 2512 and 2513. And they involve the construction, pre-operational testing and operational preparedness inspections, those specific activities that are called out in those manual chapters. We're currently implementing those inspections.

Because of the unique history, including the long delay in construction for Unit 2, we developed a customized inspection program, and that inspection program is contained in Inspection Manual Chapter 2517. It was developed at the beginning of the effort when TVA said they were going to resume construction. We spent quite a bit of time looking at what guidance we needed to cover our inspections for Unit 2.

As part of the customized effort there are two points I'm going to talk about right here. The first point to recognize, a substantial amount of the Unit 2 system structures and components had been previously constructed by TVA and inspected by the NRC during the initial time period in the '70s and the '80s. Because of that level of effort done by the NRC, we went back and reviewed those inspection reports that took place during that time frame to identify what we had inspected as compared to the inspection requirements of the manual chapter to identify what remaining inspections needed to be done. And there were several of the inspection procedures where we found out that we had pretty much completed all the activities.

An example would be concrete structures. A very detailed inspection is required for concrete. Obviously, all the concrete was poured back during the initial construction, the majority of it was. We had completed those inspection procedures at that time. So our effort for that example would be any new work on concrete. We would cover it under the applicable inspection procedures. And there's been a few instances where we've actually done concrete inspection, but for the most part it's been very limited.

Another area of the unique inspection program or customized inspection program for Unit 2 was to look at other areas that we would need to add to our plate. And that really dealt with the time frame from when these inspection programs were developed back in the '70s and the '80s to where we were currently at in 2007. So those other items dealt with some of the corrective action programs and special programs that TVA developed to deal with the quality assurance issues that were identified when construction stopped in the mid-'80s, many of the generic communications that had transpired during that time frame. So there would have been generic letters, bulletins, some of the TMI follow-up action items. So we looked at those. Historical open items. They would have been violation. Unresolved items that the NRC had identified during the initial construction had not closed out our completed. Construction deficiency reports and historical allegations.

So what we did, we took all those efforts and screened through them several different ways to be able to come up with those items that were applicable to Watts Bar Unit 2. So given the output of that effort, along with the inspection procedures in Manual Chapter 2512, we identified, as you see on the screen right there, 553 unique inspection items that we needed to inspect for Watts Bar Unit 2.

Next slide. So where we're at right now with inspection programs for Unit 2. A significant effort has been applied for Unit 2.

And, Gina, can you go to the next slide? It kind of shows you the level of effort that we did in 2014 as compared to previous years. And I highlight that just to let you know that we certainly are increasing our level of inspection as the project end nears and we're having to get out there and again look at these 553 items. That's for the construction inspections. And then I'll talk a little more about the other areas that we're doing. But again, so this gives you a sense of how we've been approaching Unit 2 and last year the level of increase that we had for inspection activities.

Go back to the previous slide. So our current status for those IP&S items. We've closed out all of them with the exception of 94 items. So those are the ones that are open. For all of those items, or for the vast majority of them, we've done some level of inspection, but there are certain parts that are left to be done.

So what we're waiting on for those remaining items: We've identified the areas that we need to look at to close the inspections. We've interfaced with TVA as far as their construction schedule. When are those things planned to be performed? And then we've gone in and with our inspection schedule we've tried to lay out those and have inspectors available to look at those items.

I'll give you an example of kind of how we've approached that following that process I just talked about. So out of the 94 items 13 of them are tied to hot functional testing. So there are specific activities that TVA will accomplish during hot functional testing that we need to go out and witness or we need to take a look at the results of the testing to verify and complete those inspections.

And I'll bring out one example. Bulletin 88-11 that dealt with pressurizer surge line thermal stratification. So we've already done some inspection for that item. We've looked at TVA's review of the issue and their associated documents, and we're satisfied that the approach they've taken has addressed the staff's issues that were identified in the bulletin. But what's remaining is an inspection activity to go out and actually look at pipe movement, thermal growth, make sure it's consistent with the assumptions that were in their analysis and that we'd been able to close that item out.

One of the other areas in addition to construction inspections that's taking a lot of our time right now deals with pre-operational testing. So that's specified in Manual Chapter 2513, the different tests that we need to witness. And we're currently following TVA's schedule as they're doing the tests that we have selected for witnessing. We've accomplished those inspections. And again, we're really just kind of waiting as TVA goes forward with the testing of these systems and components that we can go ahead and witness those and complete our activities.

The biggest challenge has been, as you probably are aware of -- is just the dynamic nature of testing and the changes in the schedule. We've had to spend a lot of time interfacing with TVA, understanding what are proposed, changes to those proposed dates and making sure we have inspectors available to follow those activities.

To date our inspections have revealed that the testing program has gone fairly well. We look at their procedures up front and make sure they're adequate, their acceptance criteria is there. We witness them and then we look at the documents. And so far we haven't seen any problems with pre-operational testing.

So the only point I really wanted to make on here -- so these inspection hours -- so for last year in 2014 the total effort was right at 23,500. And that's direct inspection effort plus the effort that the staff in Region II takes to support inspections, whether that's interfacing with TVA on scheduling and planning, and there are other activities that fall under that umbrella. So I don't want to say we spent almost 24,000 hours inspecting. That's the collective effort by the staff and Region II.

So we've looked at the remaining inspections that we need to do. Those would be the IP&S construction items, pre-operational testing inspections and the operational preparedness inspections. We've looked at the remaining work left to be done, given some level of effort as far as how much time we think we need to spend on each of those remaining items, and we're confident that we have sufficient inspectors available to accomplish these inspections in support of TVA's schedule for when they're looking to finish construction and have an operating license.

There's a lot of work left to be done between now and then, but we're closely following their activities. And I don't want to say for all cases, but for most of it what we're trying to do is wait for them to finish a particular activity, make sure it's identified and then we have inspectors available when they're finished with work, testing, so we can then complete our inspections. That's where we want to be, instead of having a large backlog of our activities that we need to do. And for the most part we've been successful in doing that.

So the operational preparedness inspections. They're specified in Manual Chapter 2513, Appendix Bravo, and they deal with operational -- or they deal with management controls and procedures that are necessary to ensure that a utility; TVA in this case, can successfully operate a plant. And they cover such things as quality assurance programs, security, operations, radiological controls. And this is another area that we had to somewhat customize this inspection program, and the manual chapter allows that.

For a second unit where they're going to use the existing infrastructure programs and processes that are in place at the site -- when they're going to use those for a second unit, you don't need to go through and look at all areas. You can customize it. And that's what we've done, really focusing on programs and procedures that are unique to Unit 2 or programs and procedures that will require substantial changes to cover Unit 2.

Currently we've completed 21 of the 36 inspection procedures for operational preparedness, so we're a good ways as far as performing those inspections. And the remaining inspections, for the most part we've got those scheduled, and again we're waiting on an activity. For example, we need to look at -- an operator licensing area that we're waiting on right there are some of the surveillance test procedures. We need to go out there and actually walk down the surveillance test procedure to make sure it's feasible, make sure TVA can accomplish it and it satisfies the tech specs. So that's an area that's still open.

MEMBER SKILLMAN: Bob, where there would be weaknesses in a Unit 1 program and Unit 2 is adopting the Unit 1 program for success in Unit 2, how do you handle that weakness in the Unit 1 program?

MR. HAAG: For the most part we're using the inspectors to look at these operational preparedness inspections that have been inspecting Unit 1 under the ROP. So for example, if we've got someone who's out there looking at radiation protection for TVA's readiness for Unit 2 areas, they're very familiar with if there's some problem areas in the Unit 1 radiation protection. So they would factor that into their level of effort, maybe increase the scope of the inspection to make sure that the additional burden that's going to be placed on an organization by now having to cover Unit 2, they've adequately -- whether it's staffing, training, equipment, whatever that might be. So that would be my answer. And that we've got staff who's familiar with the status of those Unit 1 programs and they're looking at it from can those programs now support a two-unit operation?

MEMBER SKILLMAN: Okay. Thank you.

MR. HAAG: One last thing I wanted to talk about in operational preparedness is the fire protection inspections. So we completed a three-week fire protection inspection in December and it focused on traditional fire protection areas and operator manual actions. Several problems were identified during that inspection and they really focused on two areas: procedural adequacy and operator manual actions, implementation of those manual actions. TVA has got corrective actions that are in place right. They're developing them. And our plan is once they get the corrective actions scoped out and start implementing, we'll need to go out there and inspect more in the fire protection area. So that's still an area that's underway as far as what we need to do.

MEMBER RAY: Bob, are these systemic or isolated? How would you characterize it?

MR. HAAG: As far as the procedures probably more examples of problems with procedures than we thought would exist. So that's an area that we want to make sure TVA has addressed as far as extended condition and have got their arms around it as far problems in that particular area and corrective actions that we want to apply to it.

The operator manual actions, there are a few of them where we found they have some problems with some of the considerations that TVA had for those supporting those manual actions that again they need to address.

MEMBER RAY: Okay. This apparently didn't have to do with the physical plant protector placement under --

MR. HAAG: There was one example of a manual action where there was a barrier between two fire areas, a damper. And that damper needed to close to be able to isolate the two areas because there's a manual action in one area adjacent to where a fire could be going on in the other area. Our inspection concluded that -- we questioned whether that damper would close. So there may be smoke mitigation from the fire area to where the area they're having to do the manual actions. So that was one example of a hardware problem that they're going to have to address.

Next slide. So as far as remaining actions. I think it's pretty obvious that I've gone over the construction items, the remaining IP&S areas that we need to completed. Pre-operational testing and operational preparedness, certainly we're tracking those areas. We've got -- I won't say a substantial number, but we've got a good backlog there as far as things that we need to look at.

Operational Readiness Assessment Team. We're planning for that effort right now. That's really the -- I won't say an independent, but for the most part you staff that inspection with individuals who haven't been involved with the ongoing inspections for Unit 2. We've got a team leader from Region IV assigned. We're working on the inspection plan. And our goal was to target that inspection for about 90 days prior to finishing the project. So we'll most likely do that in the April time frame.

Follow-up to the Fukushima orders. There's a temporary instruction that we have to implement, that we plan to implement for Unit 2 that will be looking at the mitigating strategies. Spent fuel pool level indication. We've got that inspection slated for March. And then I mentioned the fire protection inspections that we need to follow up on, both areas from the December inspection. And then we've got several of the IP&S items that have fire protection components that we also have to inspect.

And then lastly, or the last bullet right there is cyber security. We did a two-week inspection back late 2014 and we need to go up and complete our inspections of the various milestones that TVA has committed to as far as that regulation.

MEMBER RAY: Okay. Now, at the Subcommittee meeting I think we talked about Unit 1 lagging behind Unit 2 on cyber security, and that was an unresolved issue as to whether that was going to be the actually worked out at the end of the day. Are we looking at the whole plant here when you mention cyber security, or just talking Unit 2?

MR. HAAG: We'll do an inspection of cyber security for the site, so it will be Unit 1 and Unit 2.

MEMBER RAY: Okay.

MR. POOLE: For milestones one through seven. The first seven milestones are cyber security.

MEMBER RAY: Okay. Understood.

MR. HAAG: So as far as our path forward, we believe we're on track to support a licensing decision as far as our inspection activities and need to complete those inspection activities again that would support that decision. We believe we have adequate resources to complete the inspections. At this time. We have not identified any substantial concerns or issues that would cause us to question

TVA's ability either to build the plant or to operate it if it gets licensed.

And then the last item there is the ROP transition plan. So the ROP transition plan provides guidance and direction for transitioning the NRC's inspection of Unit 2 from construction through power ascension testing and ultimately to full implementation of the ROP for Unit 2. So we have developed the transition plan. It's in draft right now. It's been reviewed. Really it's in the final stages of review and issuance. And we've had some dialogue with TVA on that transition plan and how we step through the different inspection programs again as we go from construction through testing and ultimately to commercial operations if they get a license. And it's been a good dialogue and there are some additional points that we need to consider, but for the most part I think we've got a good plan developed. And again, we just need to finalize it.

So that's the end of my presentation. Any questions as far our inspections?

(No audible response)

MEMBER RAY: Hearing none, Justin, you going to wrap up?

MR. POOLE: Yes, I'm going to wrap up

here. So next slide. Just some of the future milestones remaining in the project. There are a few, a handful of open items that do remain in our Appendix XX list, so we are working to close those out. And obviously those will all be closed out prior to the issuance of the operating license.

As Michele mentioned earlier, we are shooting to -- our goal is to put up a Commission vote paper in the spring time to request the authority to issue the operating license when all the final required actions have been met.

And then the last two bullets there really come out of the region in that TVA needs to finish the plant so the region can go out and do all their inspections that are required such as the ORAT And then finally get the certification or the letter from the region saying that they believe the plant has been built in accordance with its design basis as one of the final steps or one of the inputs to the office director making his decision on whether or not to issue the operating license.

So with that, that concludes the staff's prepared presentation.

MEMBER RAY: Okay. We have any further questions for the staff? If not, we'll be asking for public comments that anyone has to make.

(No audible response)

MEMBER RAY: Hearing nothing for the staff, we'll ask if there's anyone in the audience and simultaneously seek to affirm that the bridge line is open. The Chairman's not indicating it's popping and so on as it does normally, so one would probably think it isn't open yet, but we'll try and rectify that.

Meanwhile, anyone who wishes to make a comment who's here in the audience, please step to the microphone.

(No audible response)

MEMBER RAY: I'm told that the bridge line is open. Is there anyone there who could affirm that to us?

PARTICIPANT: It's working.

MEMBER RAY: Thank you very much. Is there anyone on the bridge line who would care to make a comment?

(No audible response)

MEMBER RAY: Hearing none, I'll turn it back to our Chairman 10 minutes early.

CHAIRMAN STETKAR: Thank you. And I'd like to thank TVA. Good run down on all topics. It's been a long haul. Appreciate wrapping everything up and bringing it together.

And also for the staff, good, good presentation and glad to hear that the region has enough resources to finish the inspections. So I envy you.

(Laughter)

MR. POOLE: Yes, a lot of work left to be done.

CHAIRMAN STETKAR: Great. And with that, we will recess until 3:30.

(Whereupon, the above-entitled matter went off the record at 3:06 p.m. and resumed at 3:31 p.m.)

CHAIRMAN STETKAR: We are back in session and the next topic on our agenda is NUREG-0800, Standard Review Plan. A couple of sections about operating organization. And Dick Skillman will lead us through that section. Dick?

MEMBER SKILLMAN: Yes, sir, Mr. Chairman. Let me be brief. I took the lead to review the changed standard review plan sections that we will speak about today. And as I read them, I was comparing Revision 6, dated March 2007, with the proposed Revision 7, which will be approximately now, 2015. And included in the update were new words that added text regarding PRA in a number of sections.

Those were not requirements, but they were words that imbedded in the standard review plan wording that I thought could be considered substantive, hence, I thought it appropriate to bring it before the Full Committee so that they are aware of what has been added to the standard review plan.

I now understand there have been changes, so with that, I'm going to turn it over to Rick Pelton and to Jonathan DeGange to explain what has happened here.

MR. DeGANGE: So we've put together some slides to just provide an overview of the section that we've updated. So, yes, I'm Jonathan DeGange and I've been leading the staff's effort to update NUREG-0800 over the past few years. I'm a project manager in the Office of New Reactors in the Policy and Rulemaking Branch. And Rick Pelton from the Division of Construction Inspection and Operator --

MR. PELTON: Operational Programs.

MR. DeGANGE: -- Operational Programs, also known as DCIOP, is here with us as well.

So, for every standard review plan section that we update we first issue it on the *Federal Register* for public comment, as well as inform the ACRS, as well as the CRGR, and these sections were no different. So September of last year we issued four revised sections that I've got here under that first bullet on the *Federal Register*. And there's a citation for you, if you're interested in pulling it up.

We updated them with really four key things in mind. We incorporated lessons learned from the recent round of LWR, large light-water reactor, reviews. We provided clarifications to guidance that was already there that has historically resulted in repeated requests for additional information during the application review process. We also incorporated elements of Interim Staff Guidance that was developed over the same period. I've got a couple of slides that go to that. And the last topic that Member Skillman had indicated, the incorporation of concepts of risk-informed decision making.

So onto the next slide. So lessons learned and clarifications. We provided greater specificity in the areas of review for applications than was there previously, we updated the references to 10 CFR Part 55, which is the core part to Chapter 13. We provided references to appropriate Reg Guides that weren't previously listed that we thought important to mention, and we added more guidance on license transfers that wasn't there previously.

Next slide. We incorporated Interim Staff Guidance. There were two ISGs that we incorporated. One was on Design Certification/Combined License ISG-011, which was used for finalizing design information and tracking changes.

Go on to the next slide. We also incorporated Designed Certification/Combined License ISG-015 for tracking post-COL adherence commitments. And I've just listed a citation from one of the sections there.

So the next slide. So onto the use of risk information. Our overall approach in tackling that was that we wanted the applicants to be cognizant of risks when making decisions about changes to licensing basis and plant operations. It was just an overall common sense approach to incorporating risk into overall decision making, just to address risk on a high level. The position was that plant staff should have an awareness of risk-informed decision making and hence why we reference these optional Reg Guides, such as Reg Guide 1.174 and Reg Guide 1.175. Let's see, we added those references for applicants and for reviewers to have an awareness of the different approaches that we had endorsed explicitly.

Go onto the next slide, the final slide. Those Reg Guides are voluntary approaches and we did not indicate so in the draft revision that we issued. And we realized that. And so in issuing the final guidance we would like to clarify that indeed they are voluntary approaches. And also in some places where we had discussed them, we would like to just remove the reference to the Reg Guides altogether.

So with that, I think I can turn it over to Rick to expand further, if he'd like.

CHAIRMAN STETKAR: Let me ask -- and I have to admit my fading memory. I read through the revision and I hear what you're saying today. Is the intent that if a licensee adopts risk-informed -- I mean, what's the intent of having this awareness of risk-informed process? Suppose I'm licensee X who has taken the position that I'm not going to risk-inform anything ever in my life. Is the intent still that there should be as part of the operating organization an awareness of risk-informed decision making and that those options are available? Certainly if licensee Y has implemented some sort of risk-informed changes to their licensing basis, there certainly ought to be someone who owns that.

MR. DeGANGE: Yes.

CHAIRMAN STETKAR: That's pretty clear.

MR. PELTON: The only risk that I retained after going through and looking at the changes was in the area for where we talk about they provide the qualifications of each of the positions which have the duties and responsibilities of the positions. And it's a parenthetical that such interfaces include defined lines of reporting responsibilities. For example, from the plant manager to the immediate supervisor, lines of authority, communication channels and roles in risk-informed evaluations and decision making.

CHAIRMAN STETKAR: So there's a structure there such that if you're going to implement some of that, you'd know where it fits?

MR. PELTON: They need to be aware of it, but there's nothing really in here that has any risk implications.

CHAIRMAN STETKAR: Okay.

MEMBER SKILLMAN: Let me reinforce what I believe you just said, Rick. The proposed Revision 7 that once had all of those regarding risk have been removed except for that one parenthetical?

MR. PELTON: Correct. That's correct.

MEMBER SKILLMAN: So all of those

paragraphs and -- the words that alarm me have been --

(Simultaneous speaking)

MR. PELTON: The words that you discovered and I reviewed and I agreed and said I couldn't understand why three years ago I made those -- agreed to those changes. So --

(Laughter)

MEMBER SKILLMAN: I'm good. My concern was there was an impending, if you will, requirement of some sort that was pushing everybody towards RIODM, risk-informed operational decision making. And I'm not opposed to that, that if it's going to be in those documents it had better come at a fairly high level in terms of policy.

MR. PELTON: Yes.

CHAIRMAN STETKAR: And that's all I really wanted to accomplish. So I'm good with the changes that you have made.

MEMBER REMPE: But where are we in the process, because this was issued in August 2014, Draft 7. And now do you have another draft that's going by all these organizations that have to review it, or where are you in the process?

MR. DeGANGE: I can answer that.

CHAIRMAN STETKAR: Good.

(Laughter)

MR. DeGANGE: Okay. Usually if we make substantive changes that result from comments that we've received, we'll reissue the guidance again for public comment again.

MEMBER REMPE: Good. Okay.

MR. DeGANGE: So in this instance because the changes were pretty substantive, we're --

(Simultaneous speaking)

CHAIRMAN STETKAR: So you're going to go out for public comments on 7? Draft 7.

MEMBER REMPE: Well, Draft 7 is already out there, but --

MR. DeGANGE: Right, so it will be Draft 2.

MEMBER REMPE: Draft 7, not a Draft 8.

(Laughter)

CHAIRMAN STETKAR: Yes, but I mean Draft 2 of Rev 7.

MR. DeGANGE: Right. Right. Yes.

MEMBER SKILLMAN: Gentlemen, thank you.

MEMBER SCHULTZ: In the first bullet on this slide where you say that -- it seems like there's two different intents here perhaps, but you say the Reg Guides -- these particular ones are voluntary for risk-informed applications. Utilizing Reg Guides is always voluntary, but it seems like you're saying something in addition to that that in fact --

MR. PELTON: We said a risk --

MEMBER SCHULTZ: -- risk-informed approaches are voluntary. Is that also implied, or are you just iterating that Reg Guides are voluntary?

MR. DeGANGE: Well, yes, and I think for example with 1.174 for making license amendment requests one approach which is a voluntary approach, would be the risk-informed approach endorsed in that Reg Guide. So, yes, I think this would be iteration that they are voluntary.

MEMBER SCHULTZ: So it is a combination concept.

MR. DeGANGE: Yes, sir.

MEMBER SCHULTZ: Thank you.

MEMBER SKILLMAN: Thank you very much. And, Mr. Chairman, back to you.

CHAIRMAN STETKAR: And because we always do this, is there anyone in the room who has any comments?

(No audible response)

CHAIRMAN STETKAR: And we ought to do this because we always do, I don't know if there's anyone on the bridge line, but if anyone has been listening in, we'll open it up and see if anyone else has comments out there.

(No audible response)

PARTICIPANT: No one's on the bridge.

CHAIRMAN STETKAR: Thank you.

(Laughter)

CHAIRMAN STETKAR: And with that, probably one of the most efficient Committee briefings I've ever been involved in.

(Laughter)

CHAIRMAN STETKAR: Thank you. And we will go off the record for today and reconvene --

(Whereupon, the above-entitled matter went off the record at 3:43 p.m.)

Presentation to the ACRS Committee

South Texas Project, Units 3 and 4
COL Application Review

Design Basis Flood and Seismic

February 5, 2015

Staff Review Team

- **Seismic Siting Technical Staff**
  - Laurel Bauer, Geologist
  - Yong Li, Senior Geophysicist
  - Sarah Tabatabai, Geophysicist
  - Frankie Vega, Geotechnical Engineer

- **Hydrology Technical Staff**
  - Henry Jones, Hydrologist

- **Project Management**
  - Tom Tai, Lead PM

Design Basis Flood Review

Design Basis Flood

- Considered various flooding mechanisms (rain, hurricane, tsunami, dam breach, etc.)
- MCR breach
- Staff review documented in SER Section 2.4

Main Cooling Reservoir (MCR)

- MCR was put into operation in 1983 for STP Units 1 and 2
- 7,000-acres above grade, man-made reservoir with 12.4-mile earthfill embankment
- Non-safety related structure
- Source of make-up water from Colorado River
- Normal maximum operating level at El. 49 feet (MSL) to support all four STP units
- MCR related structures observed no deformation

Design Basis Flood Review

Evaluation

- MCR maximum operating level at 49 feet MSL
- MCR level assumed at 50.9 feet MSL in breach analysis
- Peak flood level in MCR breach analysis is 38.8 feet MSL
- Design basis flood level at 40 feet MSL
- Site nominal grade at 34 feet MSL

Seismic Review

Evaluation

- COL FSAR Section 2.5.2 GMRS is based on an updated EPRI-SOG (1986) seismic source model and the EPRI (2004, 2006) GMM, endorsed by NRC at the time of application
- In response to staff's RAI (under SER Section 22.1), NINA evaluated the potential impact of the CEUS-SSC model on the characterization of seismic hazards at the STP site using hard rock hazard curves for the nearby Houston Test Site detailed in NUREG-2115 (CEUS-SSC) and site amplification functions specific to the STP site
- NINA concluded STP COL application GMRS did not need to be revised
- The STP site-specific SSE envelopes both hazards
- Staff performed confirmatory analysis and agreed revised GMRS not necessary

Questions

Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- COL – Combined License
- CEUS – Central and Eastern United States
- EPRI – Electrical Power Research Institute
- GMRS – Ground Motion Response Spectrum
- MCR – Main Cooling Reservoir
- MSL – Mean sea level
- NINA – Nuclear Innovation North America
- PM – Project Manager
- RAI – Request for Additional Information
- SER – Safety Evaluation Report
- SOG – Seismicity Owners Group
- SSC – Seismic Source Characterization
- SSE – Safe Shutdown Earthquake
- STP – South Texas Project

Presentation to the ACRS Committee

South Texas Project, Units 3 and 4

COL Application Review

Fukushima Near-Term Task Force (NTTF) Recommendations

February 5, 2015

Staff Review Team

- **Technical Staff**
  - Chang Li, NRO/DSRA/SPSB
  - Raul Hernandez, NRO/DSRA/SPSB
  - Hanry Wagage, NRO/DSRA/SCVB
  - Thomas Scarbrough, NRO/DE/MEB
  - James Gilmer, NRO/DSRA/SRSB
  - Sunwoo Park, NRO/DE/SEB2
  - Sheila Ray, NRR/DE/EEEB
  - Kimberly Gambone, NSIR/DPR/NRLB
- **Project Management**
  - Tom Tai, Lead PM
  - Rocky Foster, PM

Applicable Fukushima Near-Term task Force Recommendations

- Recommendation 2.1 – Seismic and flood hazard re-evaluations
- Recommendation 4.2 – Mitigation strategies for beyond design basis events
- Recommendation 7.1 – Spent fuel pool instrumentations
- Recommendation 9.3 – Emergency preparedness regulatory actions (staffing and communications)

STP COL Design and Review

- Seismic – FSAR Section 2.5 includes the seismic criteria for STP Units 3 and 4
- External Flooding – FSAR Section 2.4S.2 defines the applicable criteria
- Extreme Winds – FSAR Section 2.3S contains the defined extreme wind conditions for storms such as hurricanes, high winds, and tornados
- Auxiliary Systems – FSAR Chapters 7, 8, and 9
- RCIC System – FSAR Chapter 5
- Emergency Procedures – FSAR Chapter 13 and Part 5

NTTF Recommendation 2.1 – Seismic and Flooding Hazard Evaluation

- Seismic and flood hazard re-evaluations are consistent with current guidance for COL applications in Chapter 2

- Sensitivity study was evaluated to address CEUS-SCC

NTTF Recommendation 4.2 – Mitigation Strategies Evaluation

- Order EA-12-049 - Address the maintenance or restoration of core cooling, containment, and SFP cooling capabilities
- Phased approach in EA-12-049 (FLEX Integrated Plan)
- Staff evaluation (JLD-ISG-2012-01) - external hazards; equipment protection; and equipment capabilities and programmatic controls
- Phase 1 (Phase 2 not necessary) – Use of RCIC, ACIWA system, and COPS, and load shed to preserve Class 1E power supply for 36 hours
- Phase 3 – Off-site equipment and abundant water supplies from FWSTs and Ultimate Heat Sink
- License condition to require development of overall integrated plan, plant procedures, FLEX equipment acquisition, training, and administrative controls

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Protecting People and the Environment

NTTF Recommendation 7.1 – Spent Fuel Pool Instrumentation Evaluation

- Order EA-12-051 requires licensees to provide reliable SFP level instrumentation
- The staff verified that the STP Units 3 and 4 SFP level instrumentation meets all the design and programmatic features identified in Order EA-12-051
- ITAAC (Table 3.0-28) to verify as-built versus as-designed
- The staff confirmed that the SFP level instrumentation meets all the design and programmatic requirements of Order EA-12-051. Therefore, the staff finds that the SFP level instrumentation complies with the intent of Order EA-12-051

NTTF Recommendation 9.3 – Emergency Preparedness Evaluation

- Applicant needs to address emergency preparedness communications and staffing
- NEI 12-01, Revision 0 (Guidelines for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities) will be used in assessing staff and communications capabilities
- Results of the assessment will be addressed in the detailed Emergency Plan procedures developed during implementation of operational programs in FSAR Section 13.4S (and in concert with STP Units 1 and 2)
- License Condition 22.4.1 to require the staffing and communications capability

Questions

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Protecting People and the Environment

Acronyms

- ACIWA – A/C Independent Water Addition System
- ACRS – Advisory Committee on Reactor Safeguards
- CEUS-SSC - Central and Eastern U.S. Seismic Source Characteristics Model
- COL – Combined License
- COPS – Containment Over-Pressure Protection System
- DE – Division of Engineering
- DSRA – Division of Safety and Risk Analysis
- DPR – Division of Preparedness and Response
- EEEB – Electrical Engineering Branch
- FSAR – Final Safety Analysis Report
- FWST – Fire Water Storage Tank
- ITAAC – Inspections, Tests, Analyses, and Acceptance Criteria
- MEB – Mechanical Engineering Branch
- NEI – Nuclear Energy Institute
- NRO – Office of New Reactors
- NRR – Office of Nuclear Reactor Regulation
- NSIR – Office of Nuclear Security and Incident Response
- NRLB – New Reactor Licensing Branch
- NTTF – Near-Term Task Force
- PM – Project Manager
- RCIC – Reactor Core Isolation Cooling System
- SCVB – Containment and Ventilation Branch
- SEB2 – Structural Engineering Branch 2
- SFP – Spent Fuel Pool
- SRSB – Reactor Systems, Nuclear Performance & Code Review Branch
- SPSB – Plant Systems Branch
- SSE – Safe Shutdown Earthquake
- STP – South Texas Project

Presentation to the ACRS Committee

South Texas Project, Units 3 and 4

COL Application Review

NRC Bulletin 2012-01

February 5, 2015

Staff Review Team

- **Technical Staff**
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  - Tania Martinez-Navedo, NRR/DE/EEEB
  - Craig Harbuck, NRO/DSRA/SPSB
  - Hien Le, NRO/DSRA/SPBB
  - Odunayo Ayegbusi, NRO/DSRA/SPRA
  - Marie Pohida, NRO/DSRA/SPRA
  - Wendell Morton, NRO/DE/ICE2

- **Project Management**
  - Tom Tai, Lead PM
  - Luis Betancourt, Chapter PM

U.S.NRC UNITED STATES NUCLEAR REGULATORY COMMISSION *Protecting People and the Environment*

NRC Bulletin 2012-01 Review

<u>Background:</u>

- 2012 Byron Unit 2 event involving failure of the non-safety related offsite power supply
- Event was not detected immediately and could present a potential common cause failure
- For active plants, NRC requires:
  - Detection
  - Control room alarm
  - Automatic response to mitigate
  - Technical specifications

NRC Bulletin 2012-01 Review

Evaluation (STP Units 3 and 4 design):

- Detection: Automatic detection on the high voltage side of the MPT and the reserve auxiliary transformers (RAT-A and RAT-B)
- Alarm: Alarm in Control Room
- Mitigation: Class 1E NSR to identify open phase circuit conditions and actuate to protect the loads on the Class 1E buses
  - ITAAC: Site-specific ITAAC (Table 3.0-29) to ensure open phase condition can be detected, alarmed, and mitigated, as designed
  - TS: Include negative sequence relays in TS for operability and surveillance
  - Other Admin Programs: NSR procured as Class 1E components are in D-RAP and Maintenance Rule Programs

NRC Bulletin 2012-01 Review

<u>Evaluation (Continued)</u>

- <u>UAT</u>: Iso-phase bus ducts between MPT and Unit Auxiliary Transformers (UAT-A, -B, and -C) and between main generator and UATs
- <u>Training</u>: Training will be developed for the operation and maintenance of the monitoring system to detect an offsite power system open phase circuit condition
- <u>Maintenance and testing procedures</u>: Procedures will be developed and include calibration and troubleshooting to ensure the monitoring system functions as expected

- Procedures to direct operator response
- NRC staff finds this acceptable

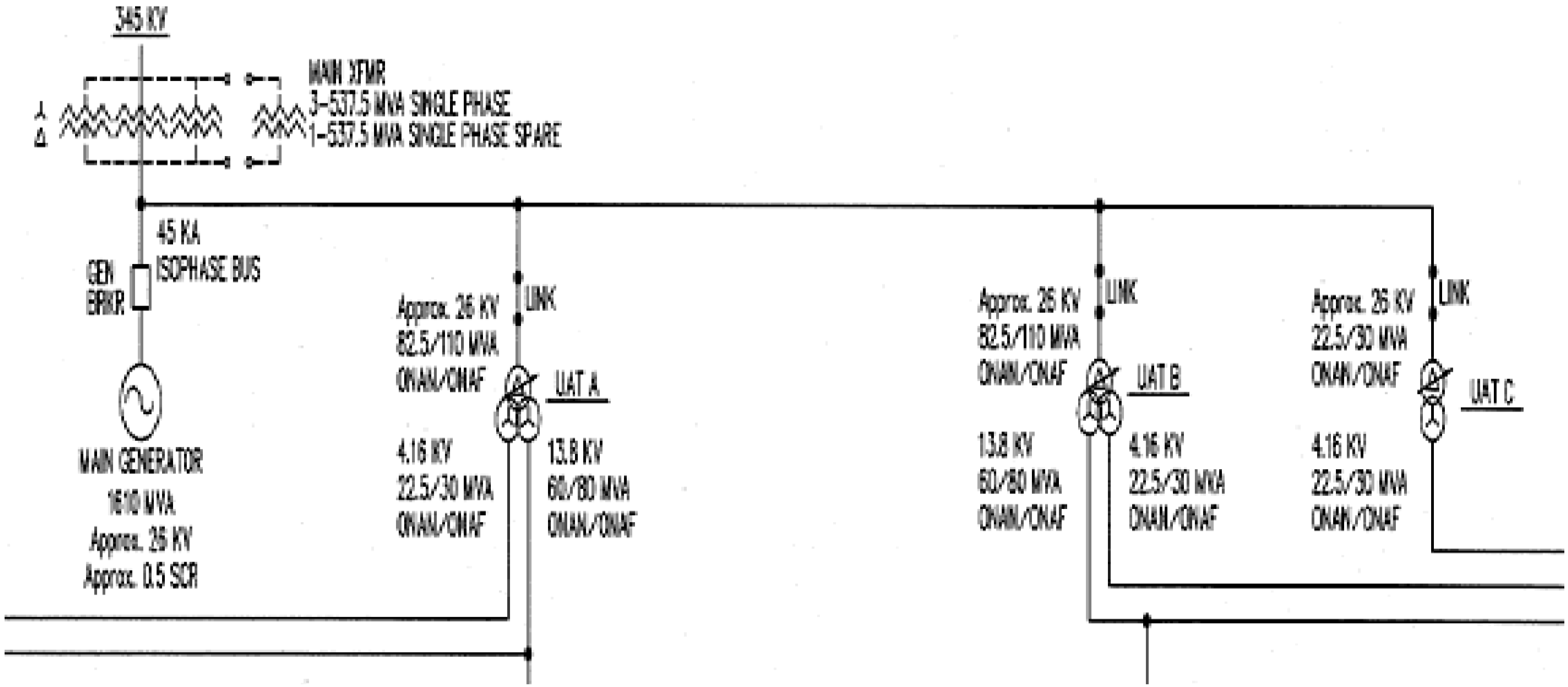
Questions

Acronyms

- COL – Combined License
- DE – Division of Engineering
- D-RAP – Design Reliability Assurance Program
- DSRA – Division of Safety and Risk Analysis
- FSAR – Final Safety Analysis Report
- ICE2 – Instrumentation, Controls, and Electronics Branch 2
- ITAAC – Inspections, Tests, Analyses, and Acceptance Criteria
- MPT – Main Power Transformer
- NRC – U.S. Nuclear Regulatory Commission
- NRR – Office of Nuclear Reactor Regulation
- NRO – Office of New Reactors
- NSR – Negative Sequence Relay
- PM – Project Manager
- PRA – Probabilistic Risk Assessment
- RAT – Reserve Auxiliary Transformer
- SPRA – PRA & Severe Accidents Branch
- SPSB – Plant Systems Branch
- STP – South Texas Project
- TS – Technical Specifications
- UAT – Unit Auxiliary Transformer

Back-up Slides

STP 3 & 4 – FSAR Figure 8.3-1



- FSAR Section 8.2.1.2 – Description of Offsite Power System
- FSAR Figure 8.3-1– Electrical Power Distribution System Single Line Diagram (Sheet 1 of 4)

Presentation to the ACRS Committee

South Texas Project, Units 3 and 4

COL Application Review

ACRS Action #64: Fire-induced Spurious Actuation in DI&C Cabinets

February 5, 2015

Staff Review Team

- **Technical Staff**
  - Dennis Andrukat, SPSB
  - Dinesh Taneja, ICE2
  - Joe Ashcraft, 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 question regarding effects of fire on digital equipment cabinets

- December 3, 2014 – ACRS Subcommittee
  - The NRC staff concluded that there is reasonable assurance that effects of fire on digital equipment cabinets will not prevent the ability to achieve and maintain safe shutdown

Fire Protection Review:
Action Item #64

<u>Conclusion</u>

- Applicant committed to follow guidance in NEI 00-01, Rev. 2 (endorsed by NRC) and RG 1.189, Rev. 2
- Safety divisions/trains physically and electrically isolated
- Safe shutdown cabinets in the Control Building, either switchgear rooms (3) or Control Room
- Control room: at least one safety division/train physically separated (i.e., DTFs, SLFs)
- I&C architecture contains robust features (e.g., diversity, redundancy)
- Staff finds the proposed approach acceptable

Questions

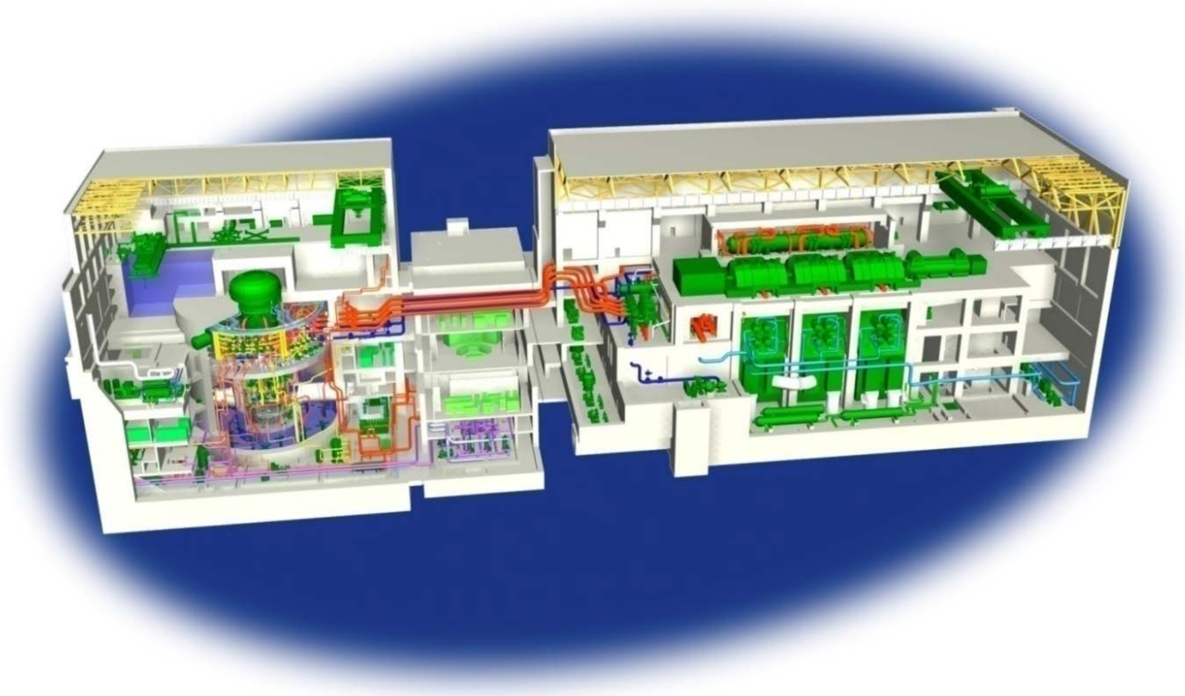
Acronyms

- ACRS – Advisory Committee on Reactor Safeguards
- DI&C – Digital Instrumentation and Controls
- DTF – Digital Trip Function
- FSAR – Final Safety Analysis Report
- I&C – Instrumentation and Controls
- NEI – Nuclear Energy Institute
- RG – Regulatory Guide
- SLF – Safety Logic Function
- STP – South Texas Project

South Texas Project Units 3 & 4

Presentation to ACRS

February 5, 2015



Attendees

- Scott Head, Regulatory Affairs Manager, NINA
- Steve Thomas, Engineering Manager, NINA
- Bill Mookhoek, Licensing Supervisor, NINA
- Jim Tomkins, Licensing, NINA
- Evans Heacock, Electrical Engineering, NINA

Agenda

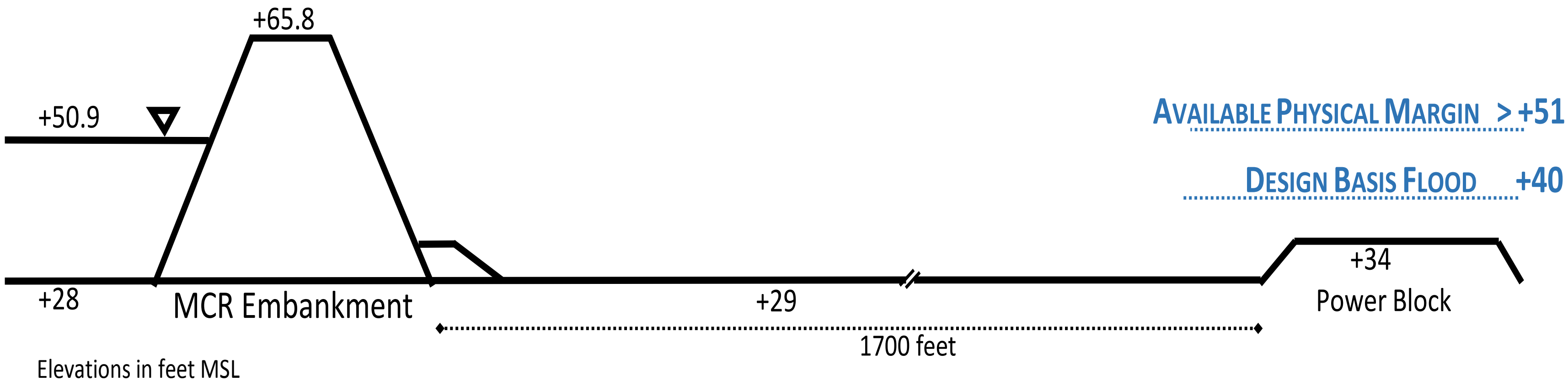
- STP Main Cooling Reservoir
- ABWR Extended Station Blackout Capabilities
- NRC Bulletin 2012-01 – Open Phase Condition
- Fire Induced Spurious Signals

South Texas Project Main Cooling Reservoir

- Main Cooling Reservoir (MCR) formed by 12.4-mile-long embankment enclosing a 7000 acre reservoir.
- MCR constructed above natural ground.
- MCR minimum embankment crest elevation is 65.8 feet Mean Sea Level (MSL).
- MCR maximum operating level is 49 feet MSL.
- MCR embankment toe is approximately 29 feet MSL at the north end.

South Texas Project Site

MCR Breach Analysis Results: Cross Section STP 3 & 4 Site Grade



Description	Elevation (feet MSL)
Available Physical Margin	**> 51**
MCR Level - Breach Analysis Assumption	50.9
MCR Level - Maximum Operating Level	49
Design Basis Flood	**40**
MCR Breach - Peak Water Level	38.8
Power Block Nominal Grade	34

Questions and Comments

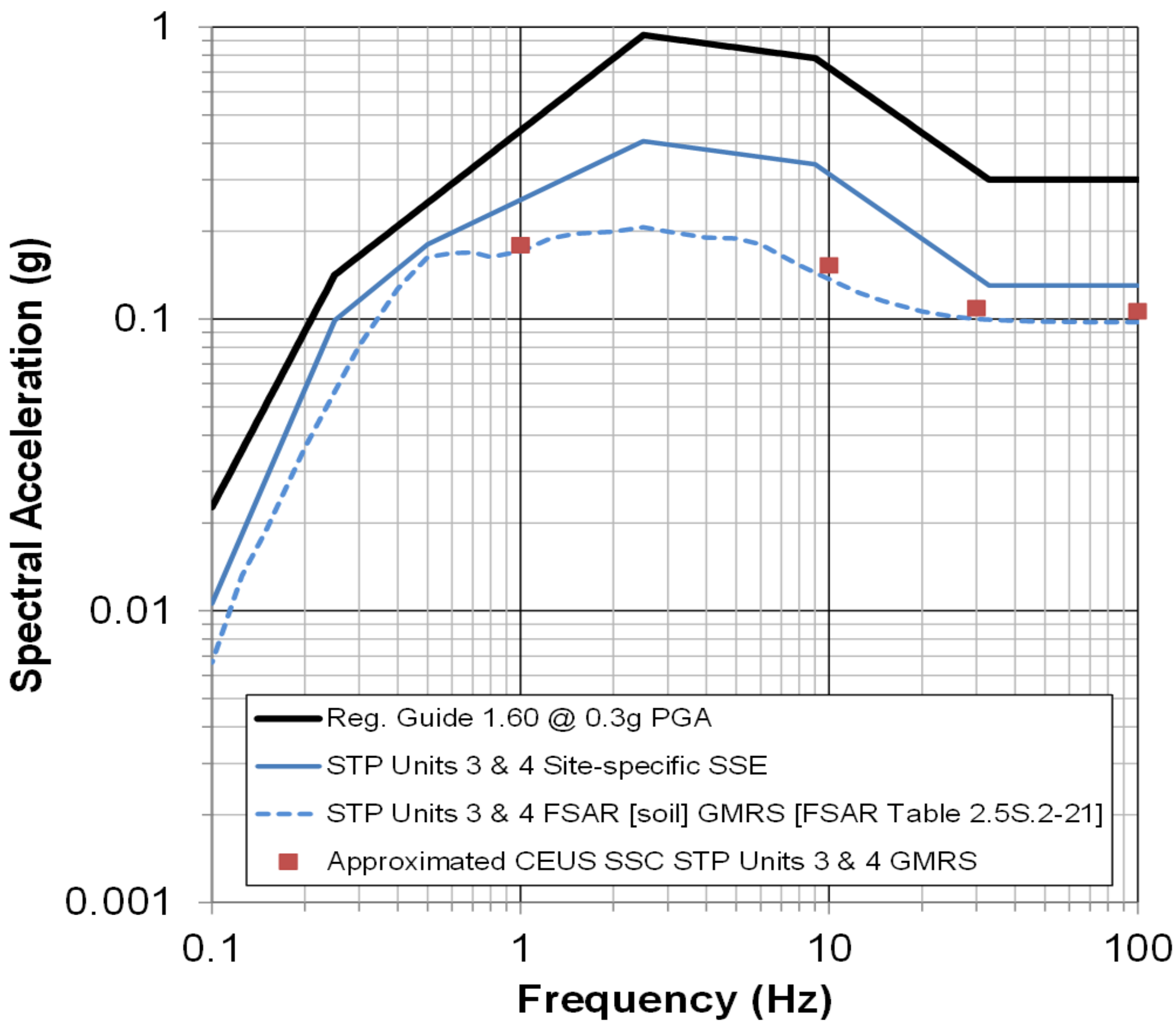
ABWR Extended Station Blackout Capabilities

- 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

Fukushima Recommendation 2.1

- Ground Motion Response Spectrum (GMRS) and Probabilistic Seismic Hazards Analysis (PSHA) for STP 3 & 4 completed in 2010
- STP 3 & 4 GMRS and PSHA based on the updated maximum magnitude distribution for STP Site using EPRI sources in a Senior Seismic Hazard Analysis Committee (SSHAC) Level II approach as defined in NUREG 6372, “Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts”
- NUREG-2115, issued in December 2011
- CEUS SSC has minimum impact on STP GMRS and the site-specific design basis SSE is conservative
- Conclusions not changed when CEUS Ground Motion Model (GMM) updated 2013

Fukushima Recommendation 2.1*(continued)*



Fukushima Recommendation 7.1

- STP 3&4 spent fuel pool (SFP) design includes reliable level and temperature monitors
- Level and temperature indication with annunciation provided in Main Control Room via process computer
- Level indication independent of process computer provided at Remote Shutdown System panel or other suitable location
- SFP level instrumentation provides reliable indication:
  - Two permanent fixed instrument channels
  - Channels separated to provide reasonable protection from missiles
  - Indication from top of fuel racks to above normal operating level
  - Instruments powered by a 1E battery
- ITAAC

Fukushima Recommendation 9.3

- STP 3 & 4 Emergency Plan (EP) will be part of a site wide plan for Units 1 through 4
- NEI 12-01 "Guidelines for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities" will be used in assessing staff and communications capabilities necessary to a multi-unit beyond design basis event
- Detailed procedures developed during implementation of Operational Programs (FSAR 13.4S) and in concert with STP 1 & 2
- License Condition

Fukushima Recommendation 4.2

STP 3&4 features that mitigate an extended SBO

- Combustion Turbine Generator (CTG)
- AC-Independent Water Addition (ACIWA)
- Reactor Core Isolation Cooling (RCIC)
- Containment Overpressure Protection (COPS)
- Substantial Battery Capability

Fukushima Recommendation 4.2

- 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

Fukushima Recommendation 4.2 – FLEX Plan

- Based on industry guidance in NEI 12-06
- 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
- Design basis external event is a flood caused by a breach of the Main Cooling Reservoir
- Extended Loss of AC Power (ELAP) and Loss of Normal Access to the Ultimate Heat Sink occurs at t = 0
- Operators declare ELAP in 30 minutes

Fukushima Recommendation 4.2 – FLEX Plan
(continued)

- 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
- RCIC operated manually after load shed
- Request for offsite supplies at ~ 2 hours
- RCIC suction switched to Condensate Storage Tank (CST) at ~ 10 hours
- COPS expected to actuate at ~ 20 hours
- Design Basis Flood is below plant grade at ~ 20 hours

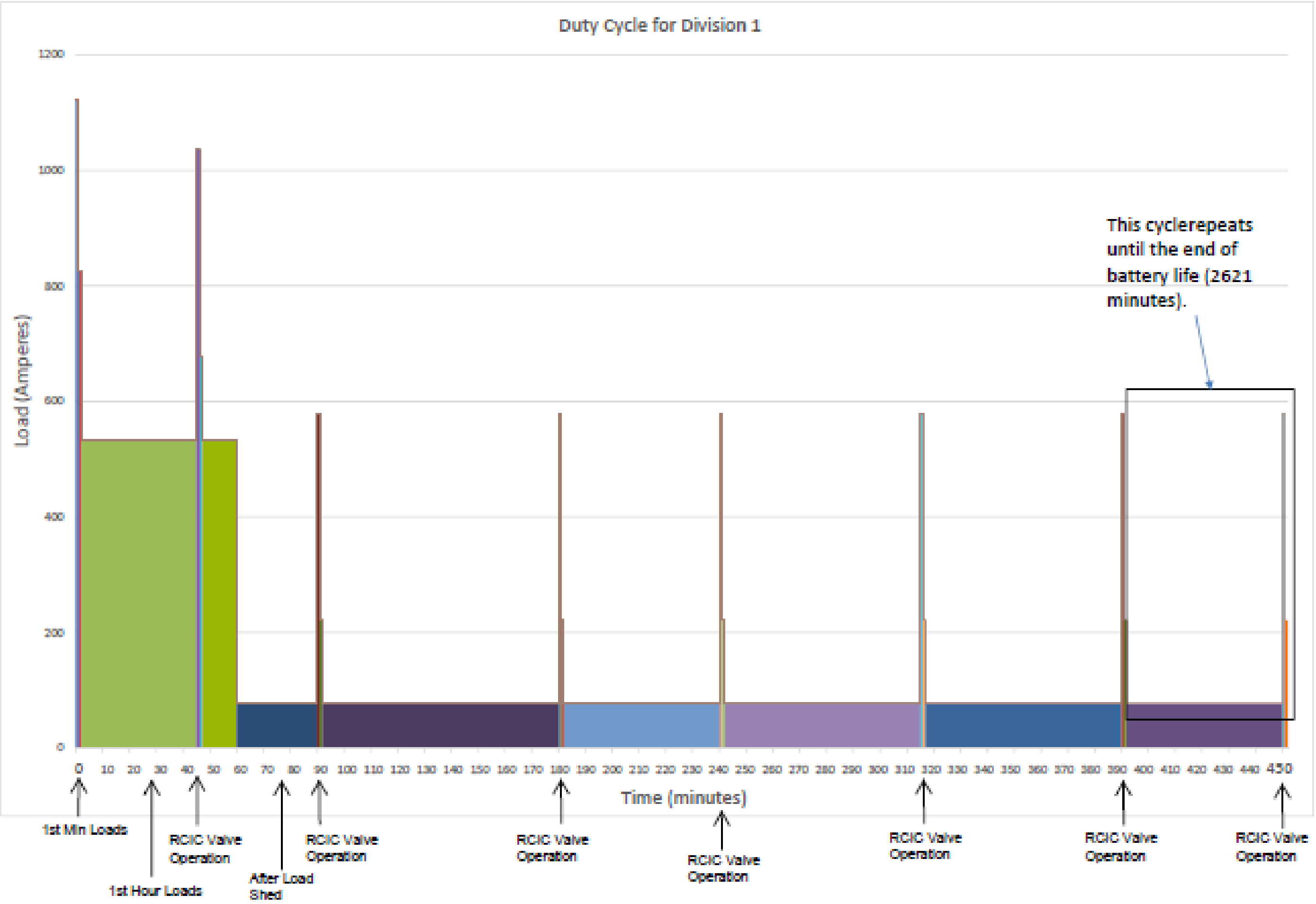
Fukushima Recommendation 4.2 – FLEX Plan
(continued)

- Offsite equipment arrives at offsite staging area at 26 hours, operational at 32 hours
- Phase III starts in 36 hours
- When CST nears depletion (> 36 hours), core cooling transitioned to ACIWA
- Ventilation restored in smoke purge mode
- Batteries being charged at 36 hours
- DC loads restored
- Command and control returned to Main Control Room
- ACIWA makeup to SFP initiated

Battery Sizing Considerations

- Based on vendor supplied battery discharge rates through 72 hours
- Uses IEEE 485 methodology for sizing lead-acid batteries
- Battery end of duty cycle voltage is 106.8 Volts
- New inverters used in plants are tested to operate at 100 volts

Class 1E Battery Load Profile



Fukushima Recommendation 4.2 – Conclusions

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

STP 3&4 Solution for Bulletin 2012-01

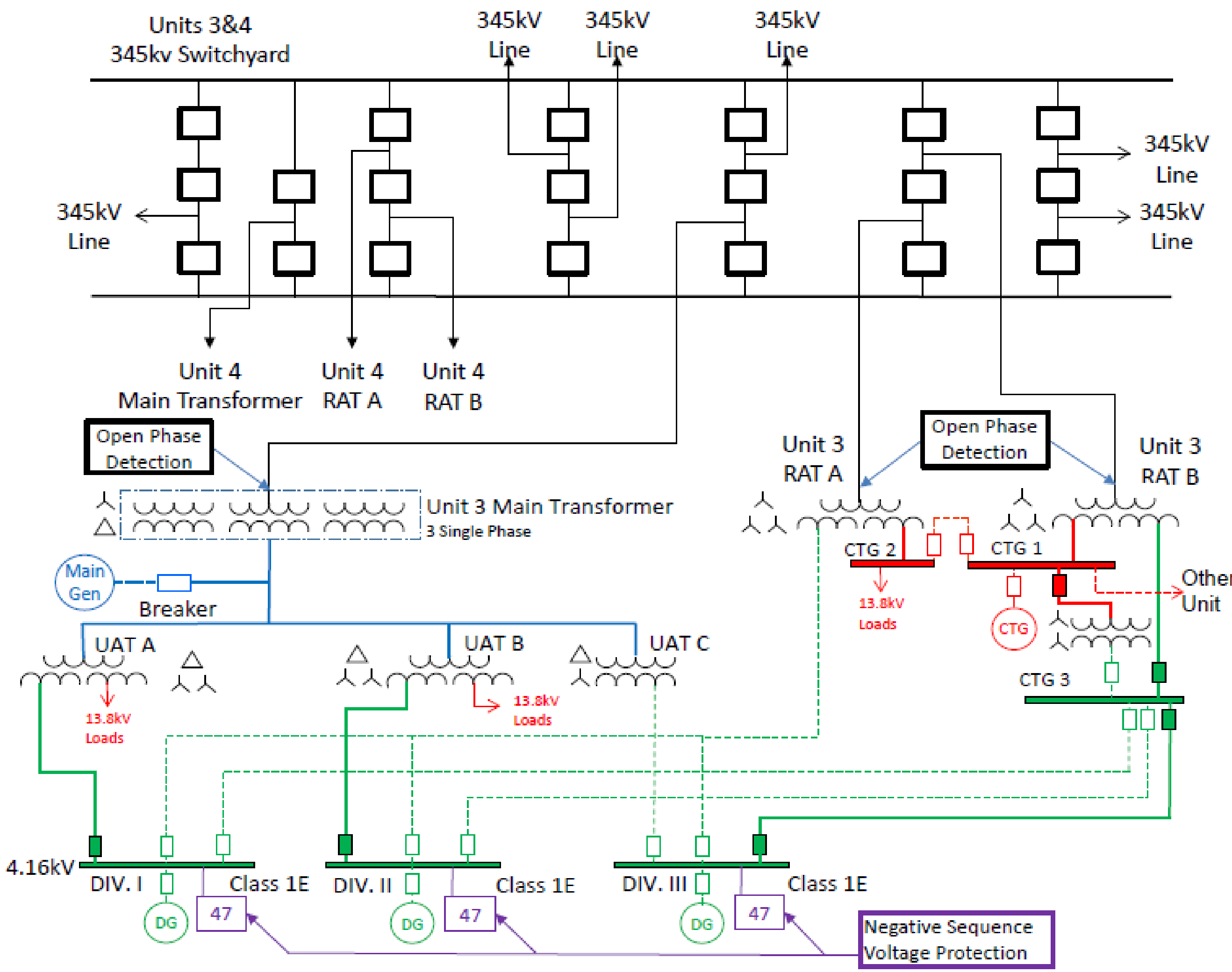
1. Detection of Open Phase (and Control Room Alarm) on the high-voltage side of Main Power Transformer (MPT), Reserve Auxiliary Transformers RAT-A and RAT-B

    - ITAAC for Open Phase Detection and Alarm

2. Protection of Class 1E 4.16 kV busses with Negative Sequence Voltage Relays

    - Alarm in Main Control Room
    - Actuation opens bus supply breakers
    - Undervoltage (UV) relays actuate causing Emergency Diesel Generator (EDG) start and pick up of load
    - Negative Sequence Voltage Relays are added to Technical Specifications (TS)

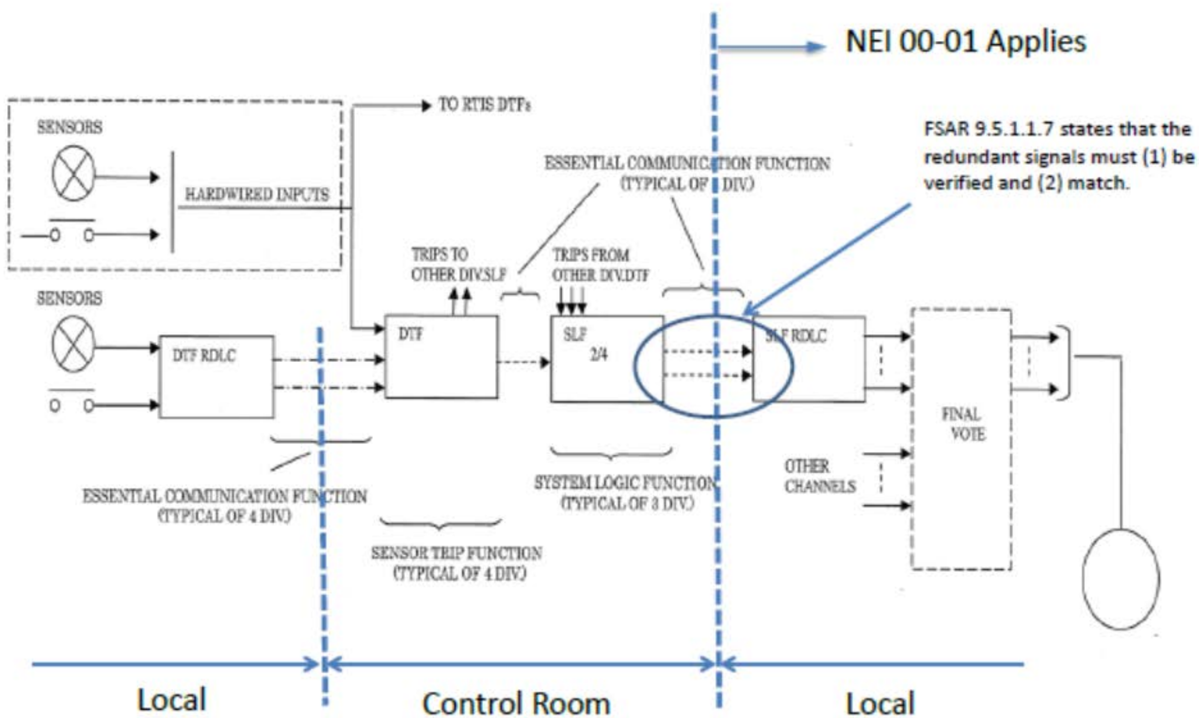
STP 3&4 Electrical Distribution System



Questions and Comments

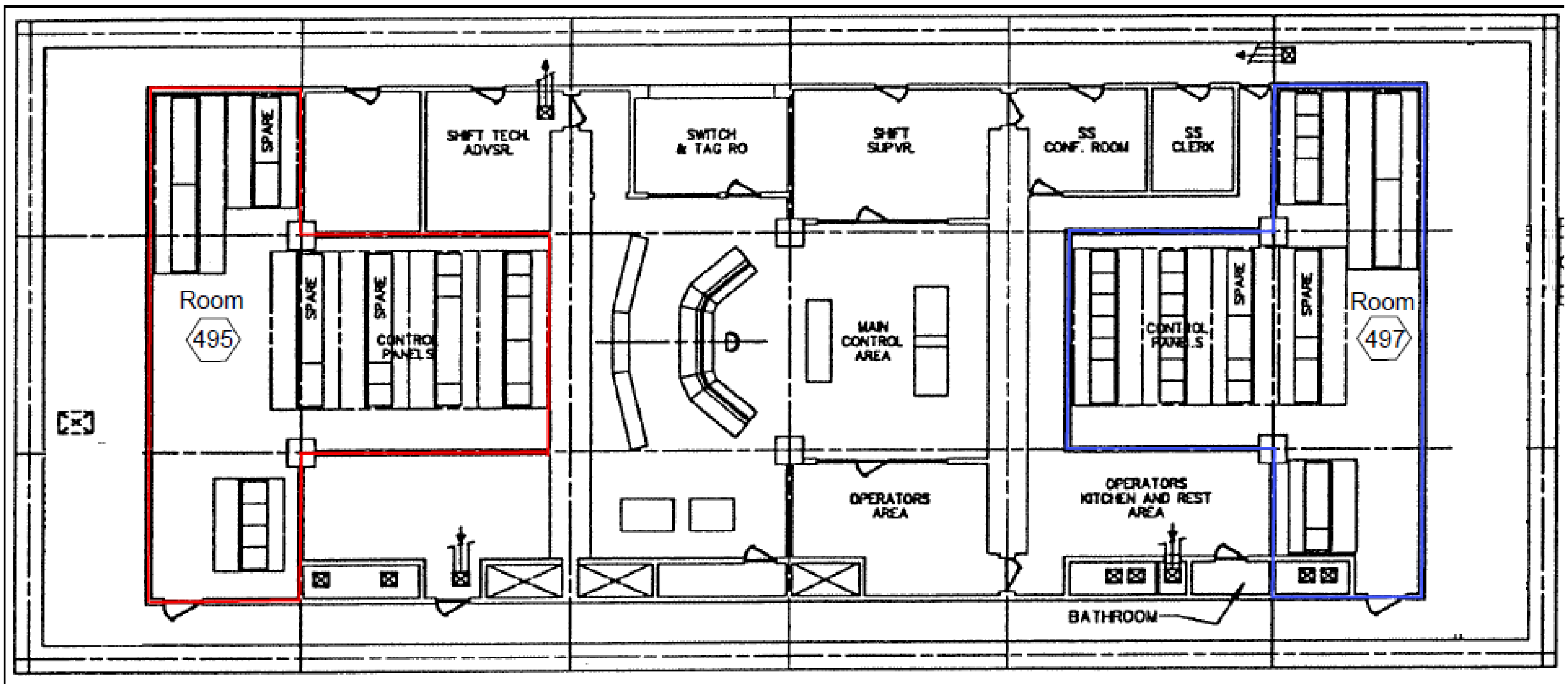
Fire Induced Spurious Signals

ESF Logic and Controls System (ELCS) Block Diagram



Fire Induced Spurious Signals

Division 2 and 4 panels are located in Rm No. 495
Division 1 and 3 panels are located in Rm No. 497



Questions and Comments

Backup Overheads

MAIN COOLING RESERVOIR Backups

COLA Requirements for Design Basis Flood:

ABWR DCD Tier 1, Table 5.0, Site Parameters, establishes the Design Basis Flood (DBF) Level at 30.5 cm below grade.

STP Departure T1 5.0-1, increased site DBF Level to 6 feet above the site grade of 34 feet above MSL (DBF Level is 40 feet above MSL)

Post-Fukushima "Available Physical Margin"

STP Available Physical Margin for Flooding (i.e., Cliff Edge) is flood level where ability to cool core is lost due to loss of EDGs:

For STP 3 & 4, this level is greater than 51 feet MSL:

- 11 feet above the design basis flood level of 40 feet MSL;
- 12.8 feet above max flood level caused by MCR breach, and
- 17 feet above nominal site grade.

Main Cooling Reservoir Embankment Breach

MCR Breach is the Design Basis Flood (DBF).

MCR Breach causing a DBF is an improbable event because:

- Overtopping not considered due to very large freeboard.
- Seismic-induced failure not plausible based on design and low potential for significant seismic activity in site vicinity.
- Failure along most of the 12.4 mile perimeter has no impact on site structures.
- Piping caused by uncontrolled water level build-up within the embankment is considered highly improbable due to engineered design (independent relief wells) and existing operation, maintenance, and inspection requirements.

Piping is the postulated failure mechanism for analysis of Design Basis Flood.

Main Cooling Reservoir Embankment Breach (continued)

Flood level resulting from MCR breach affected by the following:

- Location of the breach relative to the safety related structures.
- Size of the breach at the time of peak flow.
- Speed at which the breach develops.

Breach location conservatively selected directly adjacent to STP 3 & 4.

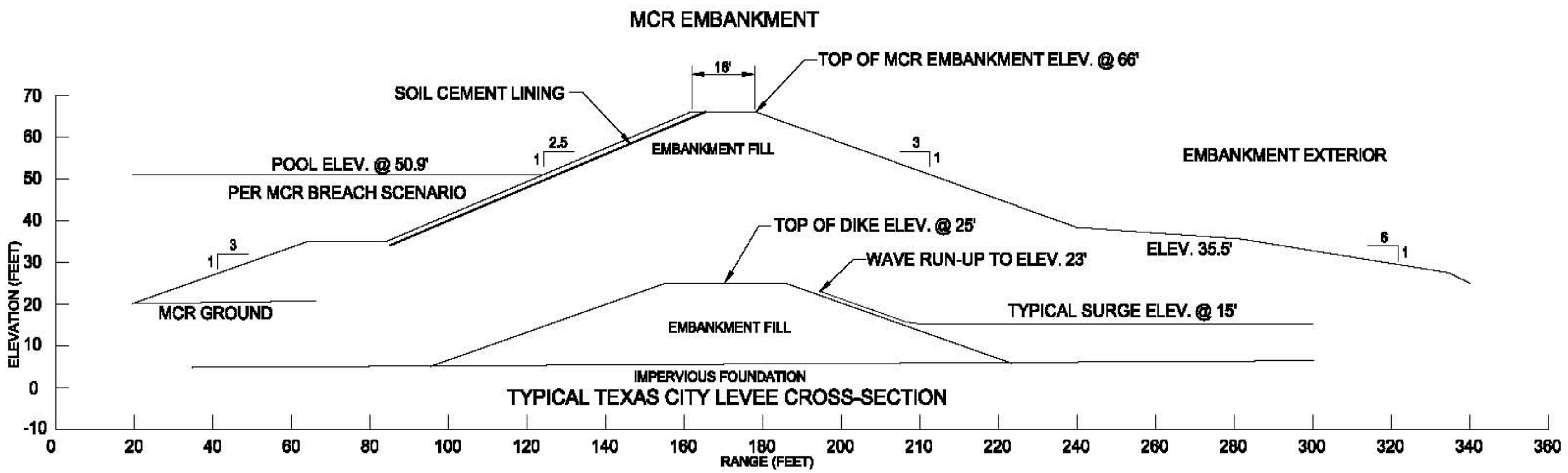
FLDWAV flow rate model (i.e., the STP COLA model) modified to use conservative assumptions for breach width and opening speed:

Breach width based on Froehlich's equations which increased conservatism; and,

Breach opening speed based on MacDonald Landgridge equation (MLM) which further increased conservatism.

BREACH flow rate model used to perform independent confirmatory analysis of the STP COLA model.

Main Cooling Reservoir Embankment Breach



MCR Embankment Cross Section

(superimposed with cross section of typical Texas City Hurricane Storm Levee)

Main Cooling Reservoir (MCR) Embankment Breach

MCR Breach Analysis peak water level is 38.8 feet MSL

- Peak water level (>38 feet) duration at the power block is very short
- Duration of inundation (above 34 feet) at power block is 20.5 hours

Design Basis Flood is 40 feet above MSL

- Reactor and Control Buildings watertight to 41 feet above MSL
- Ultimate Heat Sink Building is watertight to 51 feet above MSL

Available Physical Margin* is > 51 feet above MSL

Nominal grade level at the power block is 34 above MSL

* Available Physical Margin for Flooding (i.e., Cliff Edge) is flood level where ability to cool core is lost due to loss of EDGs.

Main Cooling Reservoir Embankment Breach (continued)

Breach Location
(Conservatively selected adjacent to STP 3 & 4)

Breach Width
(Conservatively based on Froehlich's equations)

Breach Opening Speed
(Conservatively based on MacDonald Landgridge equation (MLM))

↓

FLDWAV
Used to calculate MCR discharge vs. time

↓

RMA-2
Used to predict flood levels based on FLDWAV hydrograph

BREACH Model
(independent confirmatory analysis)

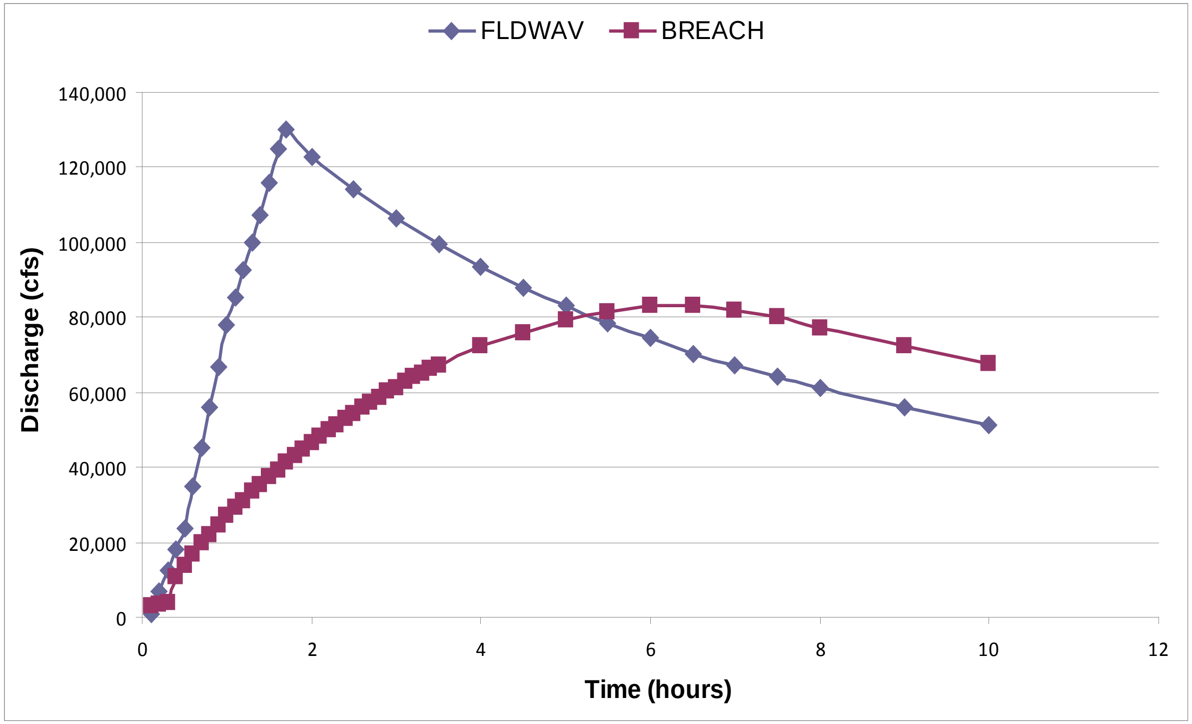
Main Cooling Reservoir Embankment Breach (continued)

MCR Breach Flow:

FLDWAV (STP COLA Model using Froehlich width and MLM time)

compared to

BREACH Model (independent confirmatory analysis)



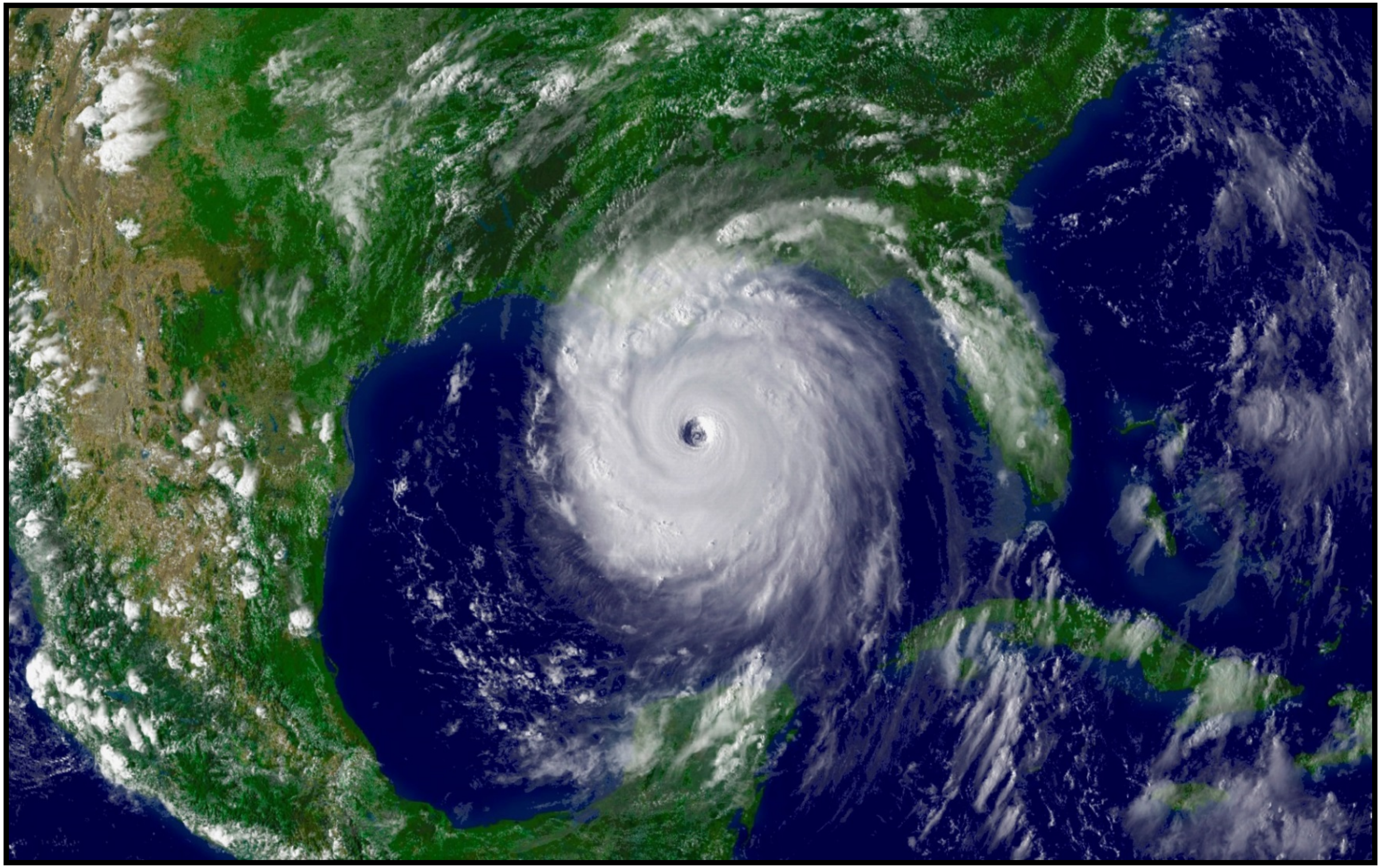
FSAR Figure 2.4S.4-13c:
Comparison of BREACH and FLDWAV Outflow Hydrographs

Main Cooling Reservoir Embankment Breach (continued)

MCR Breach Analysis results:

- Peak water level following MCR Breach predicted at 38.8 feet MSL (4.8 feet above the nominal site grade of 34 feet)
- Peak water level (38.8 feet MSL) occurs at Unit 4 UHS Structure (UHS structure and RSW Pump House Structures are flood protected to 50 feet MSL)
- Peak water level near the Unit 4 power block is 38.2 feet MSL
- Power block safety-related structures are watertight to 41.0 feet MSL (Water tight to one foot above the design basis flood level of 40 feet MSL)
- STP 3 & 4 Design Basis Flood (DBF) conservatively set at 40 feet MSL (6.0 feet above the nominal site grade of 34 feet)
- Peak water level duration is very short
- Worst case wind generated wave effect estimated at 3.1 feet
- Hydrodynamic drag force calculations include wave action.
- Splash flooding above the 41-foot elevation due to wave run-up will be minor
- Duration of inundation (above 34 feet) at power block is 20.5 hours

Probable Maximum Storm Surge



Probable Maximum Storm Surge (continued)

Wide variation between results of different computer models used by STP to calculate Probable Maximum Storm Surge (PMSS) resulting from the Probable Maximum Hurricane (PMH):

- Storm Surge Analysis modeled with SURGE and HEC-RAS
- Storm Surge Analysis modeled with various versions of Sea, Lake, and Overland Surges from Hurricanes (SLOSH)
- Storm Surge Analysis modeled with Advanced Circulation Model (ADCIRC)

GDC-2 is met no matter which model is used to predict PMSS because all models predict PMSS is less than the 40 ft MSL design basis flood level.

Probable Maximum Storm Surge (continued)

PMSS and Wave Run-up Analysis Results

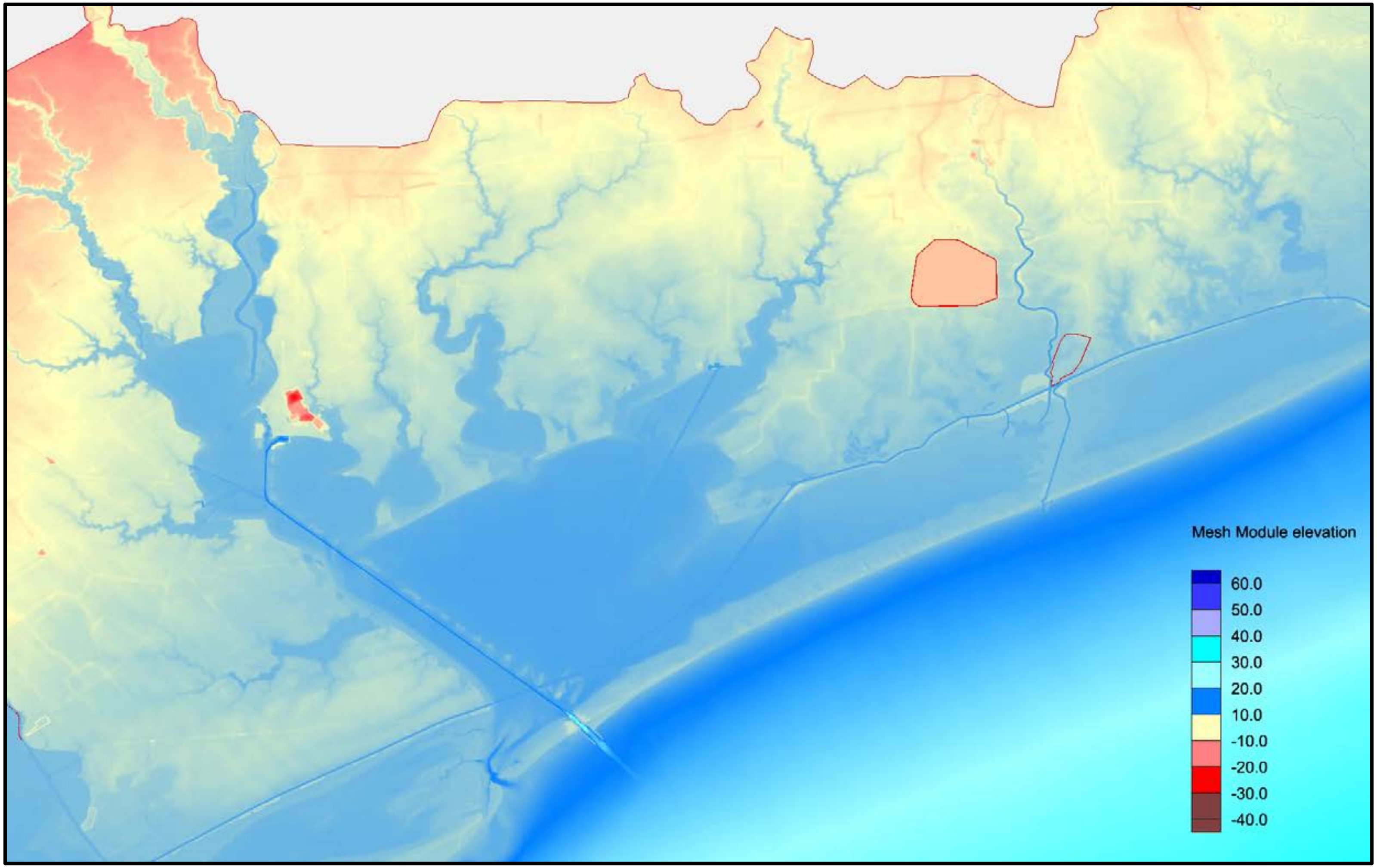
Model	Predicted Max Surge (Gulf Coast)	Predicted Max Surge (STP Site)	PMH Max Level inc Wave Run-up
SURGE + HEC-RAS Model (FSAR 2.4S.5.2.3)	20.04 feet MSL	24.29 feet MSL	Less than plant grade.
Extrapolation from SLOSH Display CDI (Version 2007) (FSAR 2.4S.5.2.4)	25.98 feet MSL	31.1 feet MSL	Less than plant grade.
NRC Confirmatory Analysis (SLOSH Model Version 2009)	21.8 to 24.2 ft MSL	Approximately 37 to 38 feet MSL	Approximately 39 to 40 feet MSL
SLOSH Model (April 2010) PMH with Decaying Intensity	Not evaluated	36.16 feet MSL	38.59 feet MSL
ADCIRC Model (Version 49 with Texas Grid 13) PMH with Decaying Intensity Inland (RAI 02.04.05-10 results)	21.5 feet MSL	26.5 feet MSL	26.5 feet MSL
ADCIRC Model (Version 49 with Texas Grid 13) PMH with Decaying Intensity Inland, using NWS 48 wind profile (RAI 02.04.05-11 results)	22.5 ft MSL w/o wave run-up 23.5 ft MSL w wave run-up	29.3 feet MSL	**29.3 feet MSL**

Probable Maximum Storm Surge (continued)

NINA evaluation concluded ADCIRC is best suited for STP vicinity based on the following:

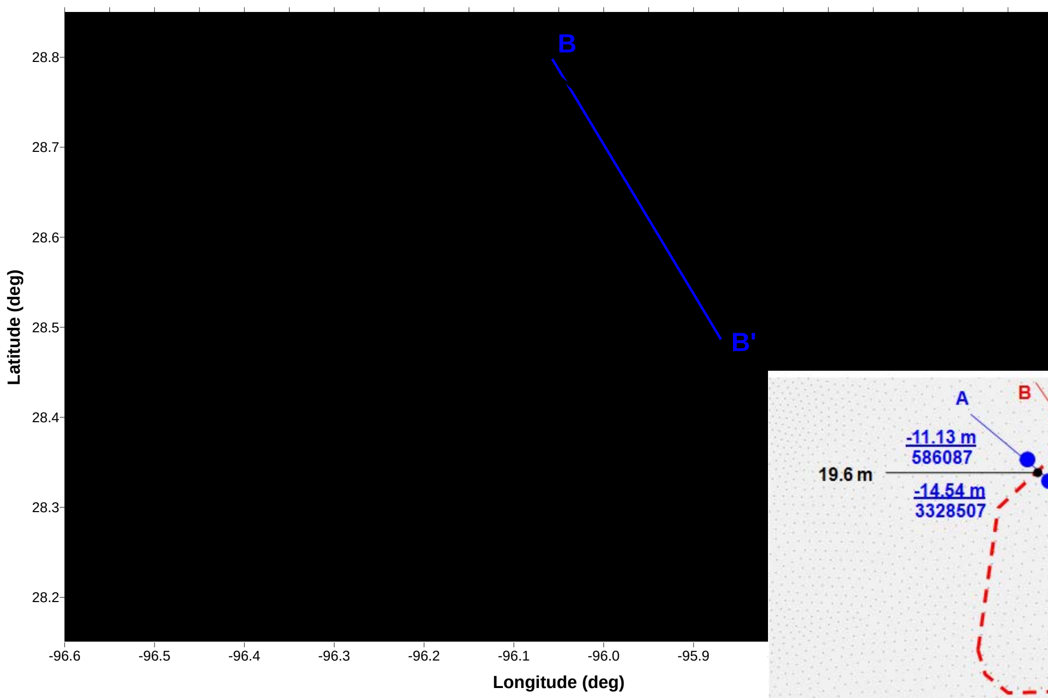
- Designed for high simulation accuracy in complex shoreline and bathymetry.
- FEMA-certified for storm surge analyses and Flood Insurance Rate Maps (FIRMs) in STP vicinity.
- Standard coastal model used by U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, the Naval Research Laboratory, and the Interagency Performance Evaluation Task Force (IPET) study.
- Digital elevation maps for STP vicinity based on LiDAR data with very high grid resolution (50 m x 50 m) for improved ability to model surface friction.
- Accurately models topographic features (*e.g.* highways) that block or accelerate storm surge flooding.

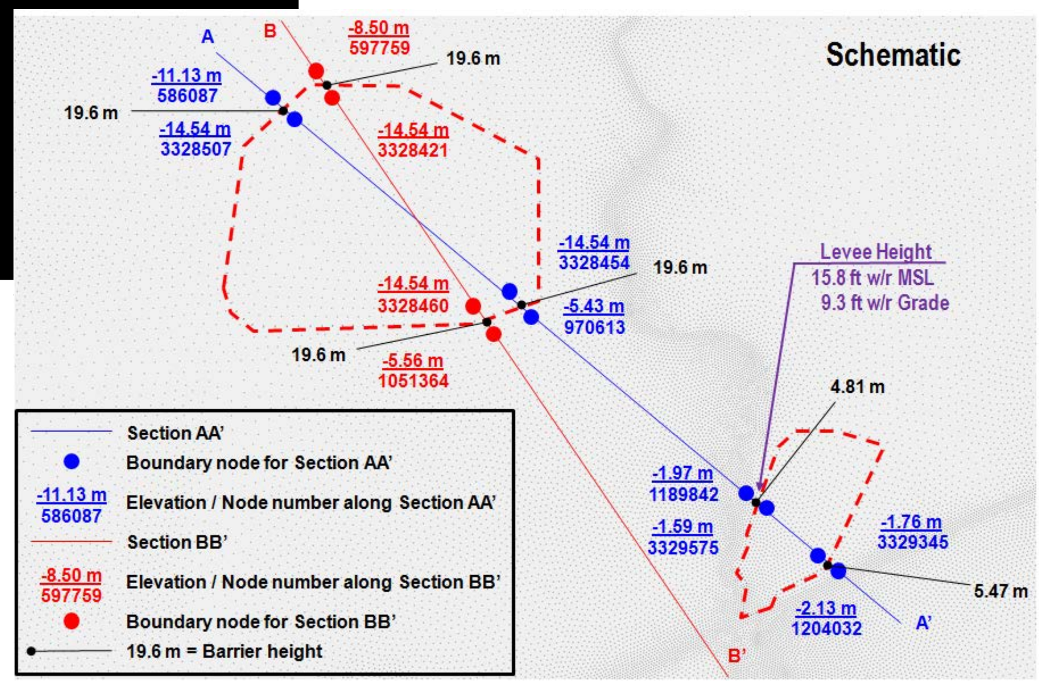
Probable Maximum Storm Surge (continued)



STP Vicinity ADCIRC Model

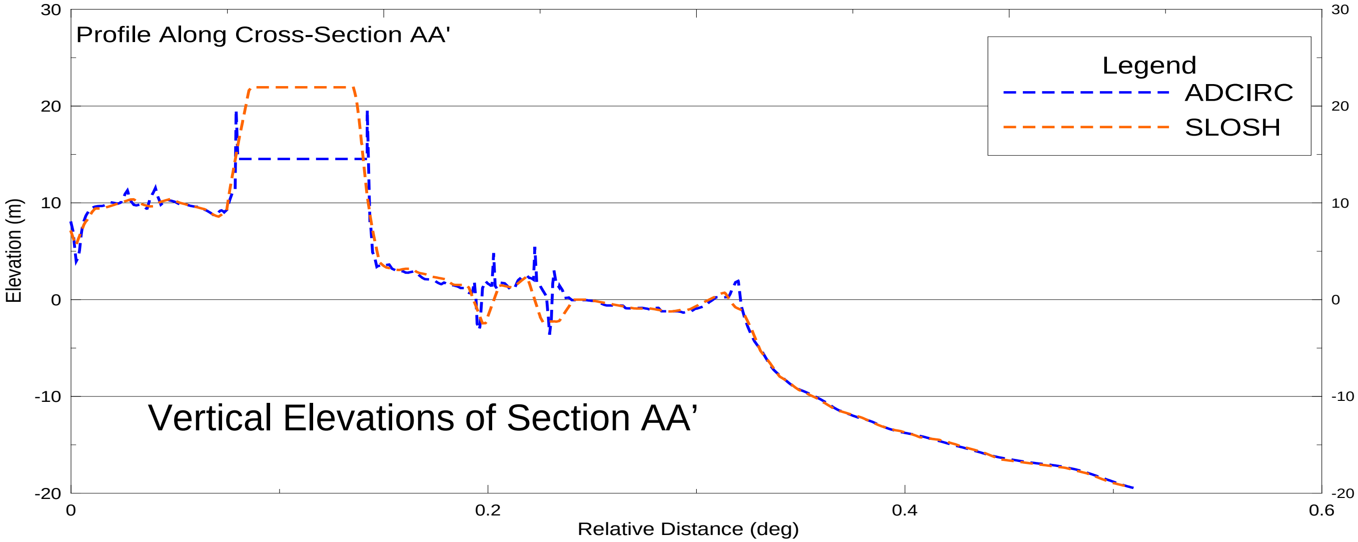
Probable Maximum Storm Surge (continued)

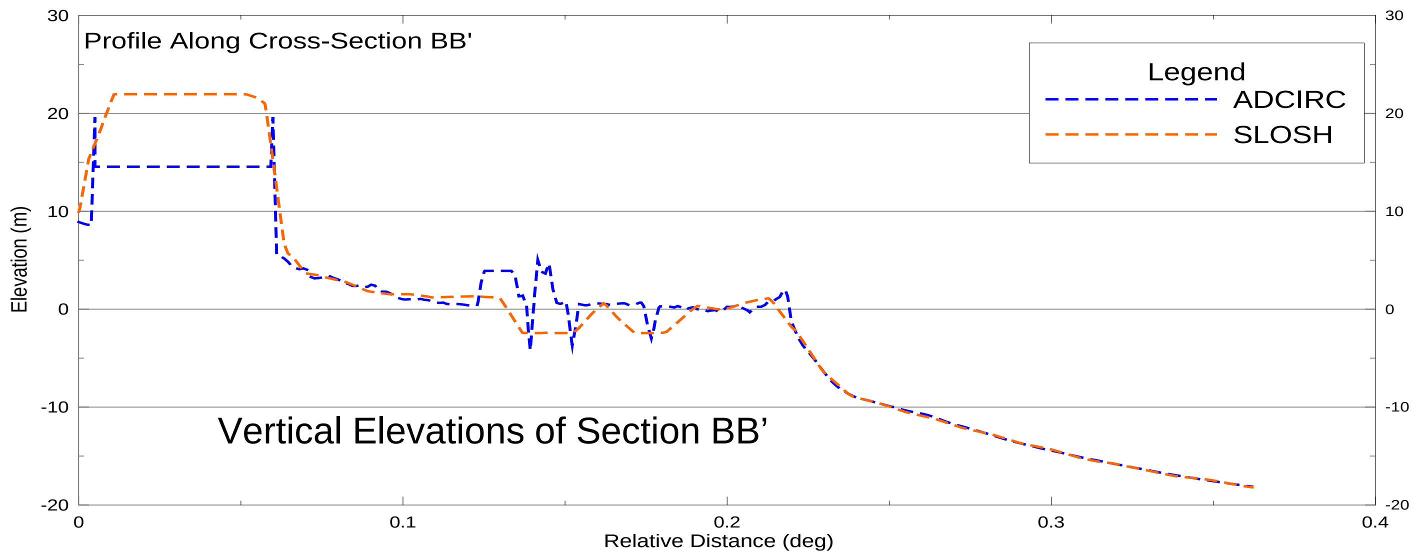




Boundary Node Features and Barrier Heights for Section AA' and Section BB'

Probable Maximum Storm Surge (continued)





NRC contracted six technical experts in the area of dam breach analysis and hurricane storm surge to review STP analysis and results:

Independent reviewers for MCR breach related issues:

- Tony L. Wahl, PE, Hydraulic Engineer, Hydraulic Investigations and Laboratory Services Group, Bureau of Reclamation;
- Gregory B. Baecher, PhD, Professor, Civil and Environmental Engineering, University of Maryland; and,
- Robert C. Patev, Senior Risk Advisor, Risk Management Center, USACE

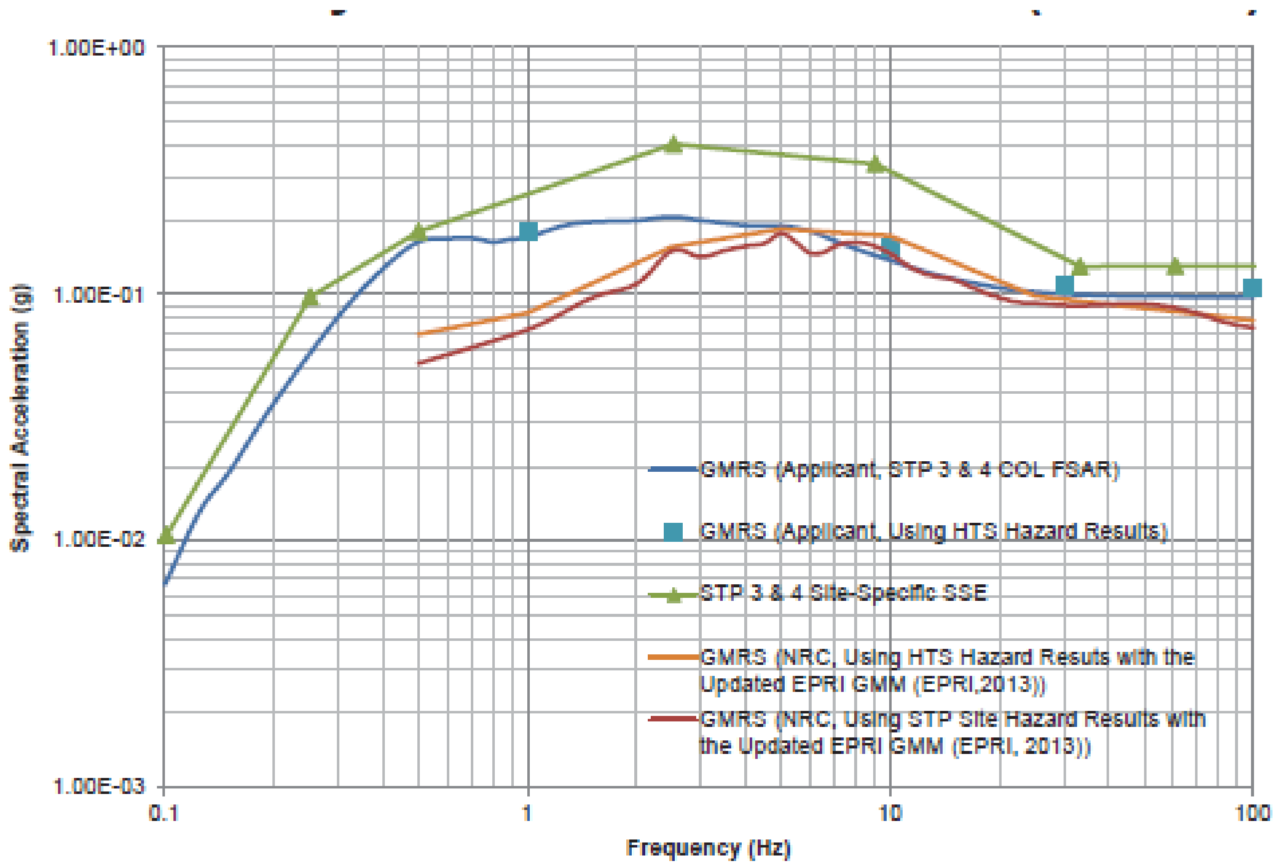
Independent reviewers for Probable Maximum Hurricane (PMH) surge issues:

- Jennifer L. Irish, PhD, PE, D.CE, Associate Professor, Virginia Polytechnic Institute and State University;
- Rick Luettich, PhD, Director of Institute of Marine Science, University of North Carolina at Chapel Hill; and,
- Donald P. Resio, PhD, Director Taylor Engineering Research Institute, College of Computing, Engineering and Construction, University of North Florida (previously of USACE Engineer Research Development Center Coastal and Hydraulics Laboratory)

Conclusion: STP analysis for both MCR breach and Storm Surge and the value provided for the design basis flood are conservative.

FUKUSHIMA Backups

Fukushima Recommendation 2.1 *(continued)*



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
  - 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
- Substantial <u>onsite</u> 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.

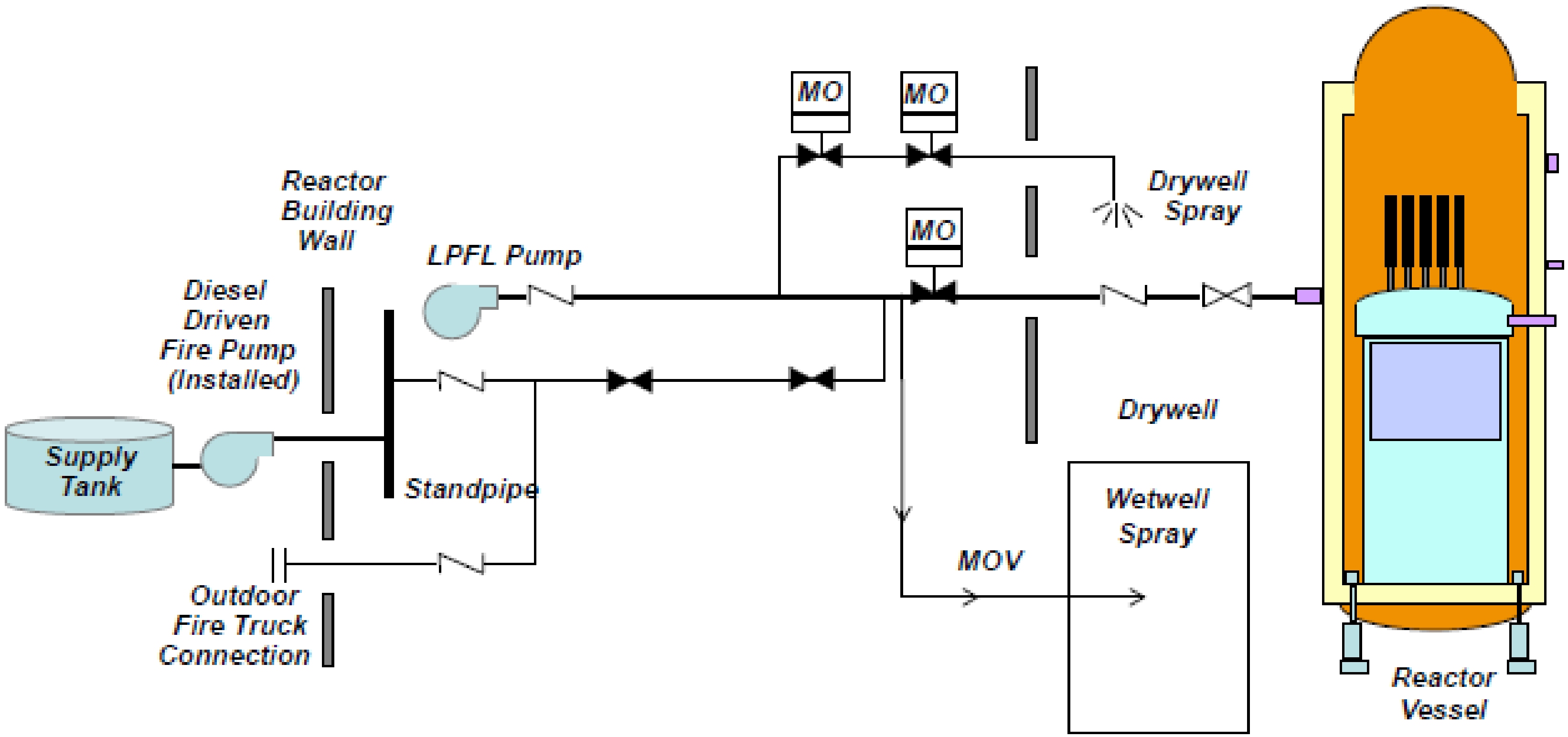
Combustion Turbine Generator

- 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

ACIWA



MO
MO
MO
Reactor Building Wall
LPFL Pump
Drywell Spray
Diesel Driven Fire Pump (Installed)
Drywell
Supply Tank
Standpipe
Wetwell Spray
MOV
Outdoor Fire Truck Connection
Reactor Vessel

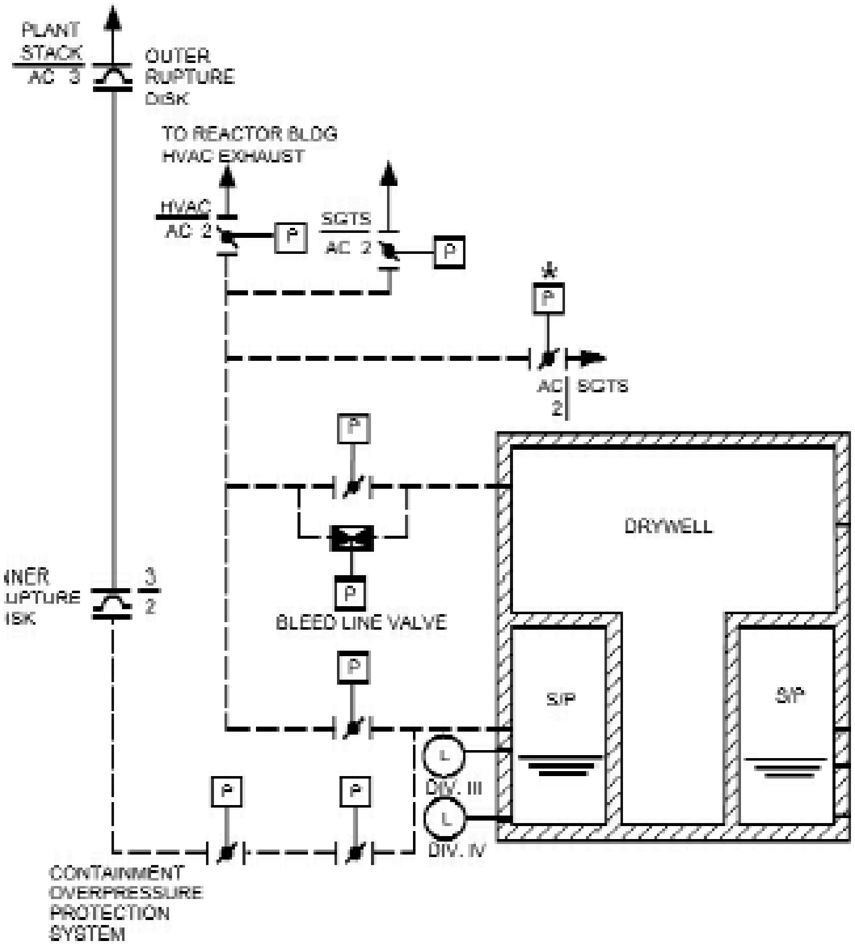
Reactor Core Isolation Cooling

- 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

COPS


PLANT
STACK
AC 3
OUTER
RUPTURE
DISK
TO REACTOR BLDG
HVAC EXHAUST
HVAC
AC 2
P
SGTS
AC 2
P
P
AC
2
SGTS
P
DRYWELL
P
BLEED LINE VALVE
P
S/P
S/P
L
DIV. III
L
DIV. IV
P
P
3
2
CONTAINMENT
OVERPRESSURE
PROTECTION
SYSTEM

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

STP 3&4 Water Resources

Item	Volume	Number & Location
Main Condenser Hotwell	2,060,542 gallons	1 per unit
Suppression Pool	945,700 gallons	1 per unit
Condensate Storage Tank	557,403 gallons	1 per unit
Demineralized Water Storage Tank	501,927 gallons	2 total for STP 3 & 4
Demin Prover Tank	200,770 gallons	2 total for STP 3 & 4
Fire Water Storage Tank	300,000 gallons	2 total for STP 3 & 4
Well Water Storage Tank	118,877 gallons	1 per STP 3 & 4 site
Filtered Water Storage Tank	118,877 gallons	1 per STP 3 & 4 site
Potable Water Storage Tank	11,888 gallons	2 total for STP 3 & 4

*Notes & comments:

1. Does not include Storage Tanks utilized by Units 1 & 2.
2. Does not include Ultimate Heat Sink (UHS) or Main Cooling Reservoir (MCR).

STP 3&4 Site Fuel Oil Supplies

ITEM	Volume	LOCATION
EDG Fuel Oil Day Tank	4,000 gals.	3 per unit located in RB
EDG Fuel Oil Storage Tank	80,000 gals.	3 per unit in under ground vault south of RB
CTG Fuel Oil Day Tank	7,000 gals.	1 per unit in proximity to CTG
Site Fuel Oil Tank	600,000 gals.	1 per unit near north end of Protected Area to facilitate filling from outside PA
Diesel Fire Pump (ACIWA) Day Tank	150 gals.	1 per site (for both units) in proximity to diesel fire pump

STP 3&4 Batteries

- Class 1E – 125VDC
  - Div I – 5104 Ah
  - Div II – 3344 Ah
  - Div III – 2992 Ah
  - Div IV – 1368 Ah
- Non-Class 1E – 125VDC
  - Group A – 800 Ah
  - Group B – 800 Ah
  - Group C – 800 AH
- Non-Class 1E – 250VDC
  - Group A – 6000 AH
- Non-Class 1E – 125VDC Security Battery
- Non-Class 1E – 48VDC Communications Battery

Remote Shutdown System
(FLEX related indications and control)

- Three Safety Relief Valves (control and indication)
- Reactor water level wide range indication
- Reactor water level shutdown range indication
- Reactor pressure indication
- Drywell temperature
- Drywell pressure
- Suppression Pool Level
- Suppression Pool Temperature (four indicators)
- Condensate Storage Tank Level

Future Actions

License Condition for Mitigating Strategies

- Administrative program will be developed for configuration control, maintenance, and testing of equipment in FLEX Plan
- Guidance and strategies for implementing the FLEX Plan will be developed, implemented and maintained
- Training program for FLEX will be developed in accordance with Systematic Approach to Training (SAT) process
- The basic configuration of the systems credited in FLEX plan will be confirmed

An integrated plan to meet these requirements will be developed 180 days prior to initial fuel load

FLEX Timeline

Figure 1 - FLEX Mitigating Strategy Summary Timeline

CORE COOLING

0	< 2 Min	10 hr.	36 hr.	72 hr.
RCIC on CST suction	RCIC on SP suction	RCIC on CST suction	ACIWA on FWST suction Phase 3 FLEX DG operating	ACIWA on UHS suction

CONTAINMENT

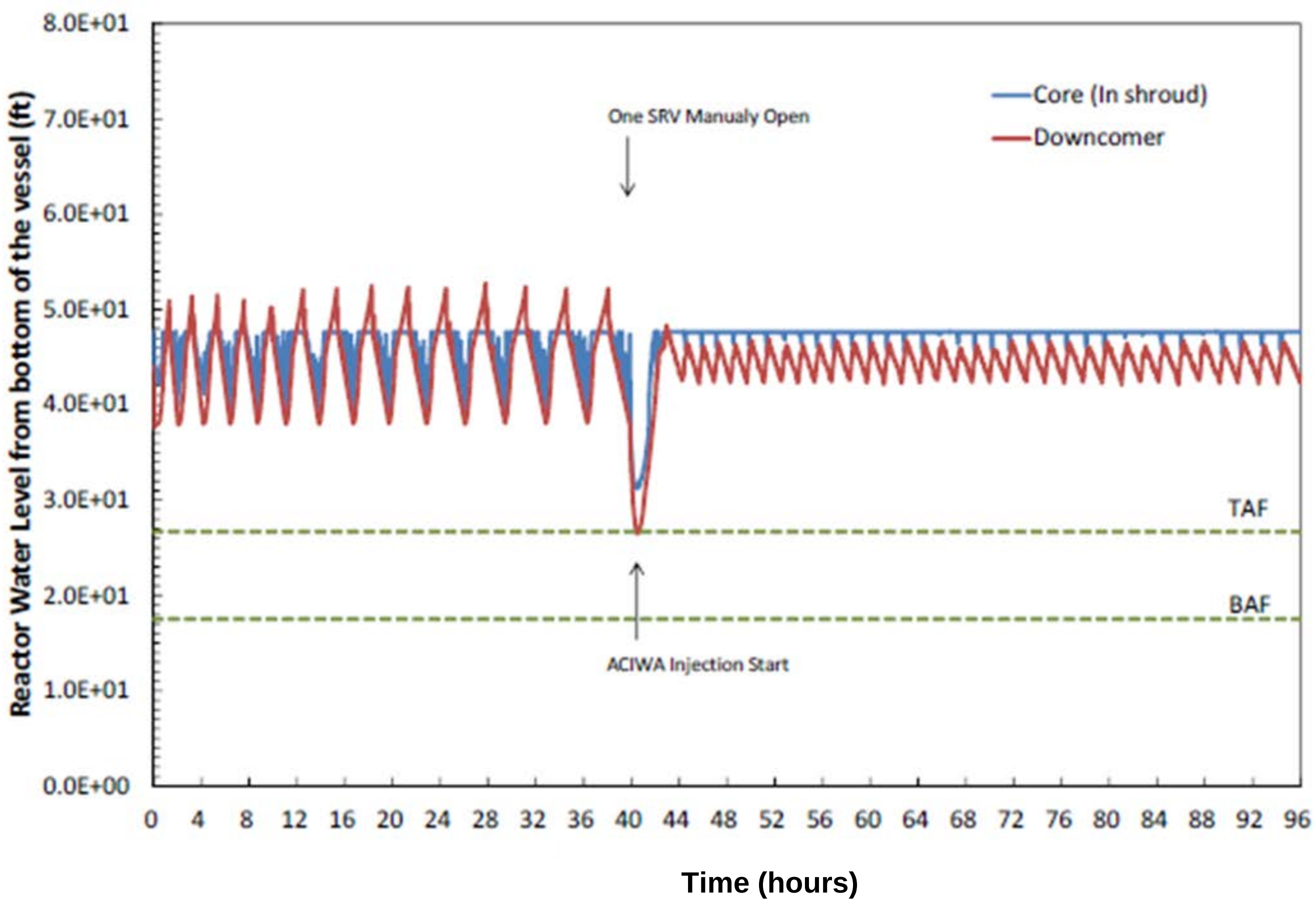
0	20 hr.	72 hr.
Containment Pressure Increasing	Containment Vented after COPS actuation	

SPENT FUEL POOL

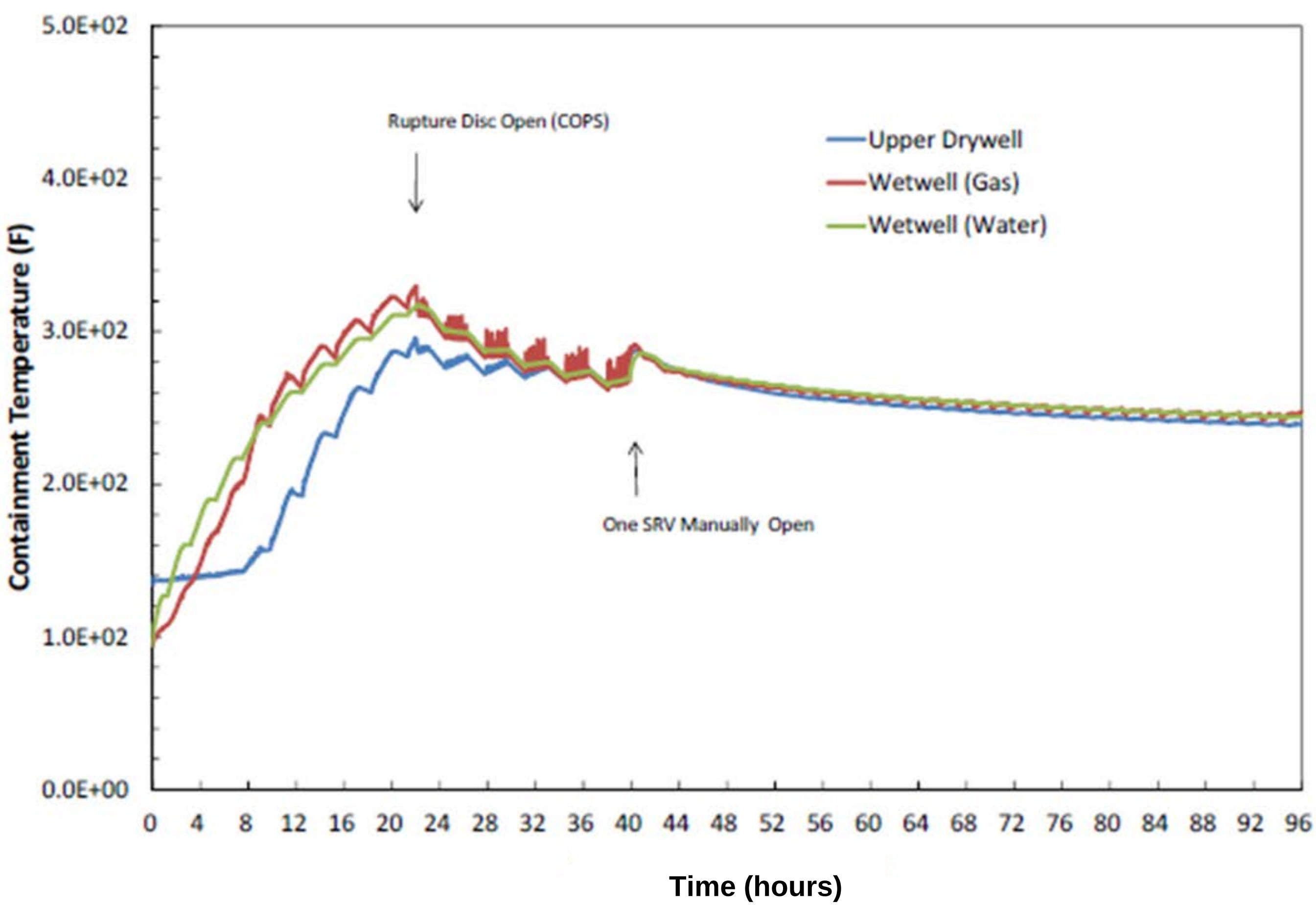
0	20	72 hr.
No SFP fill required	ACIWA available to fill SFP as necessary	

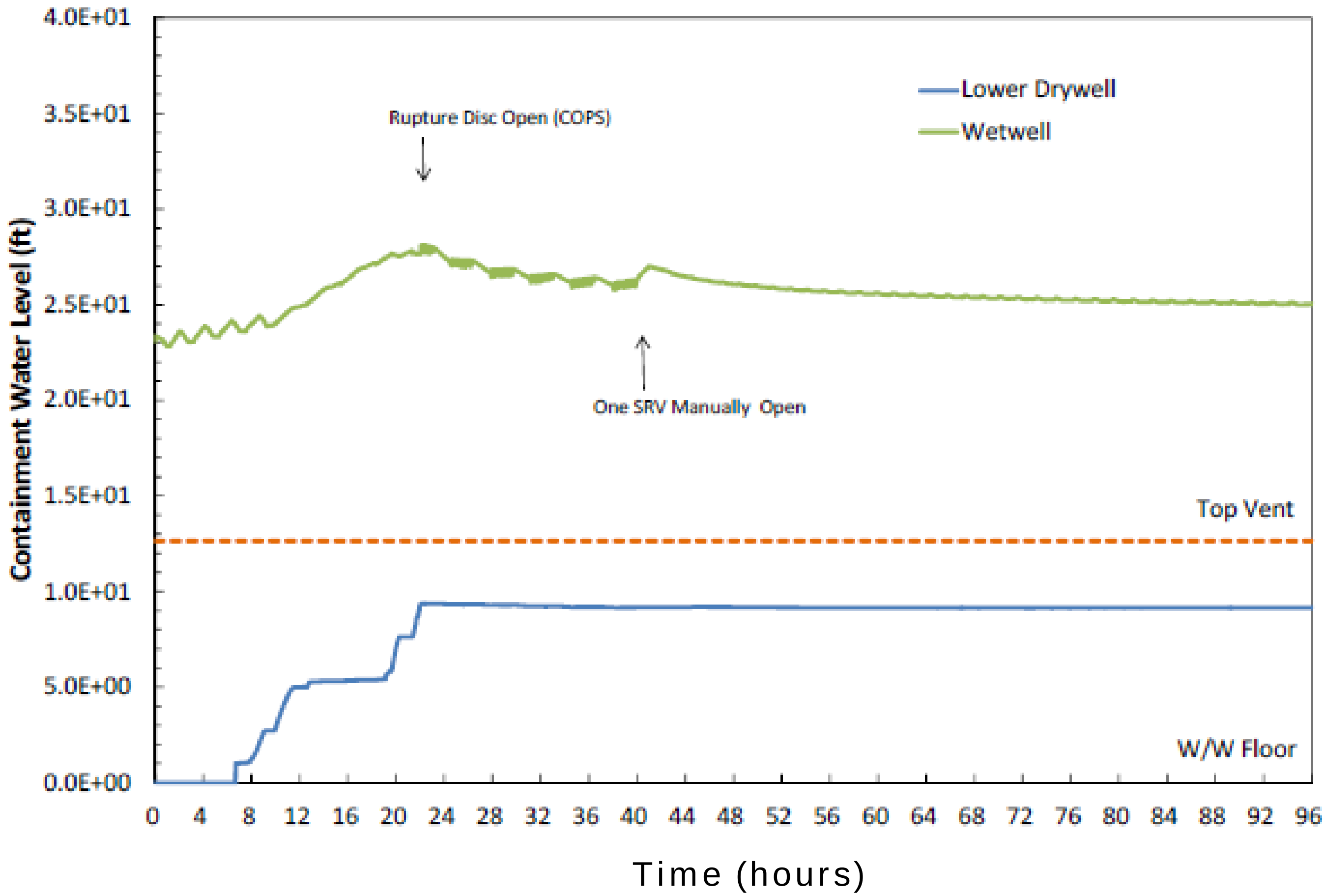
MAAP Analytical Results

MAAP Reactor Water Level

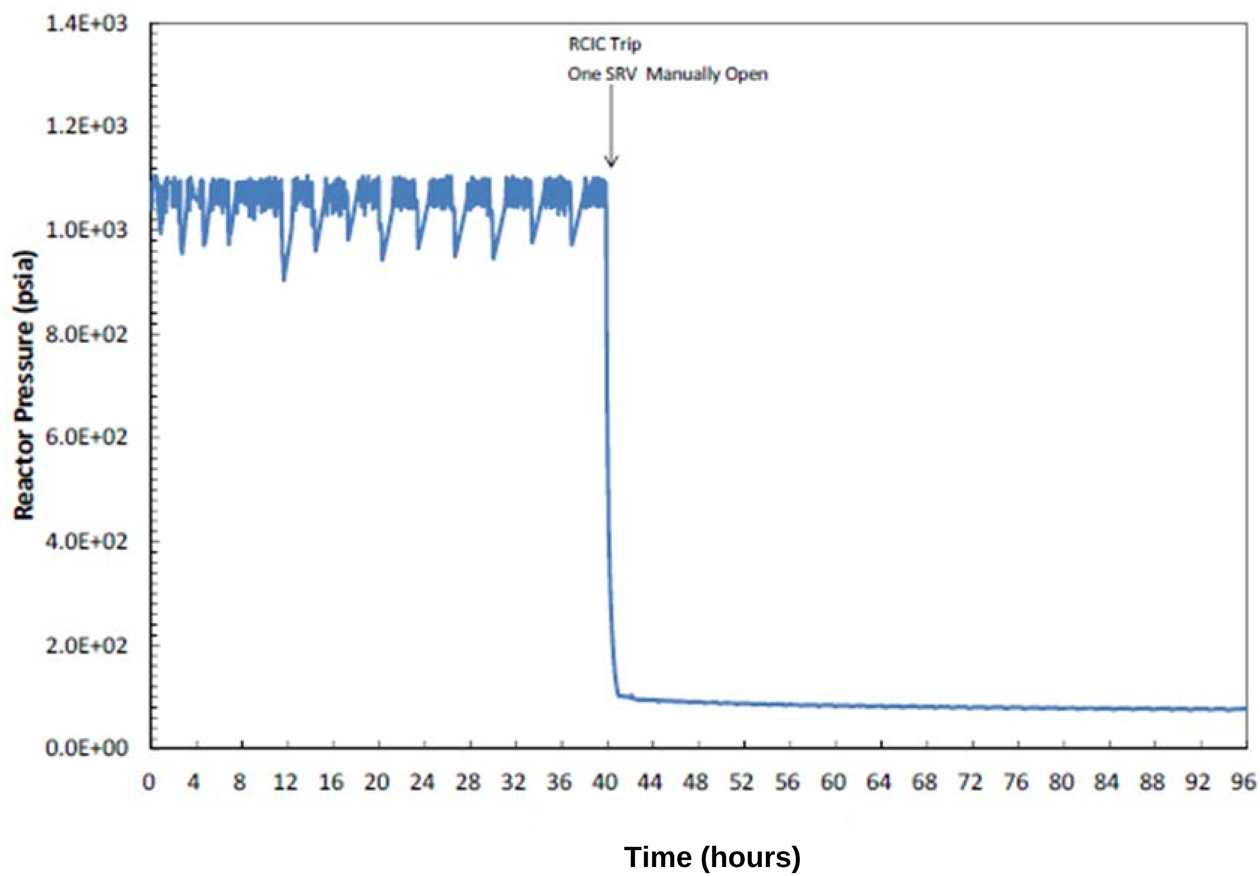


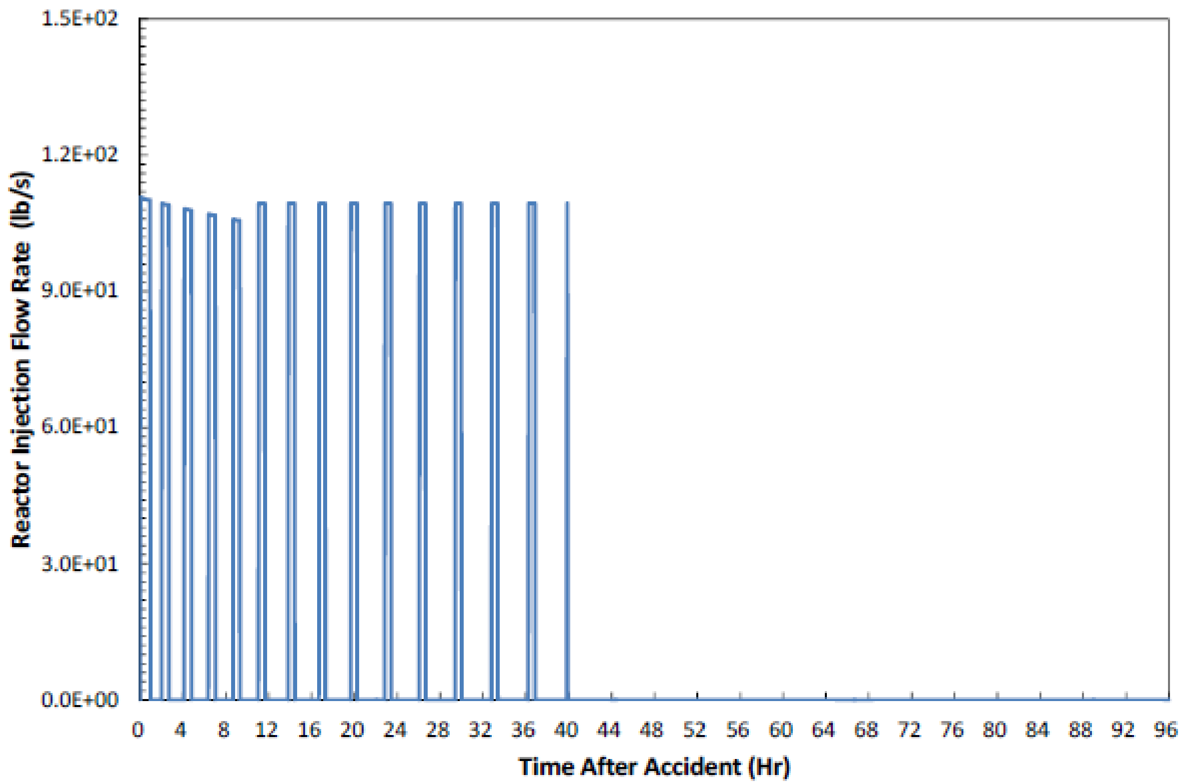
MAAP Containment Temperature

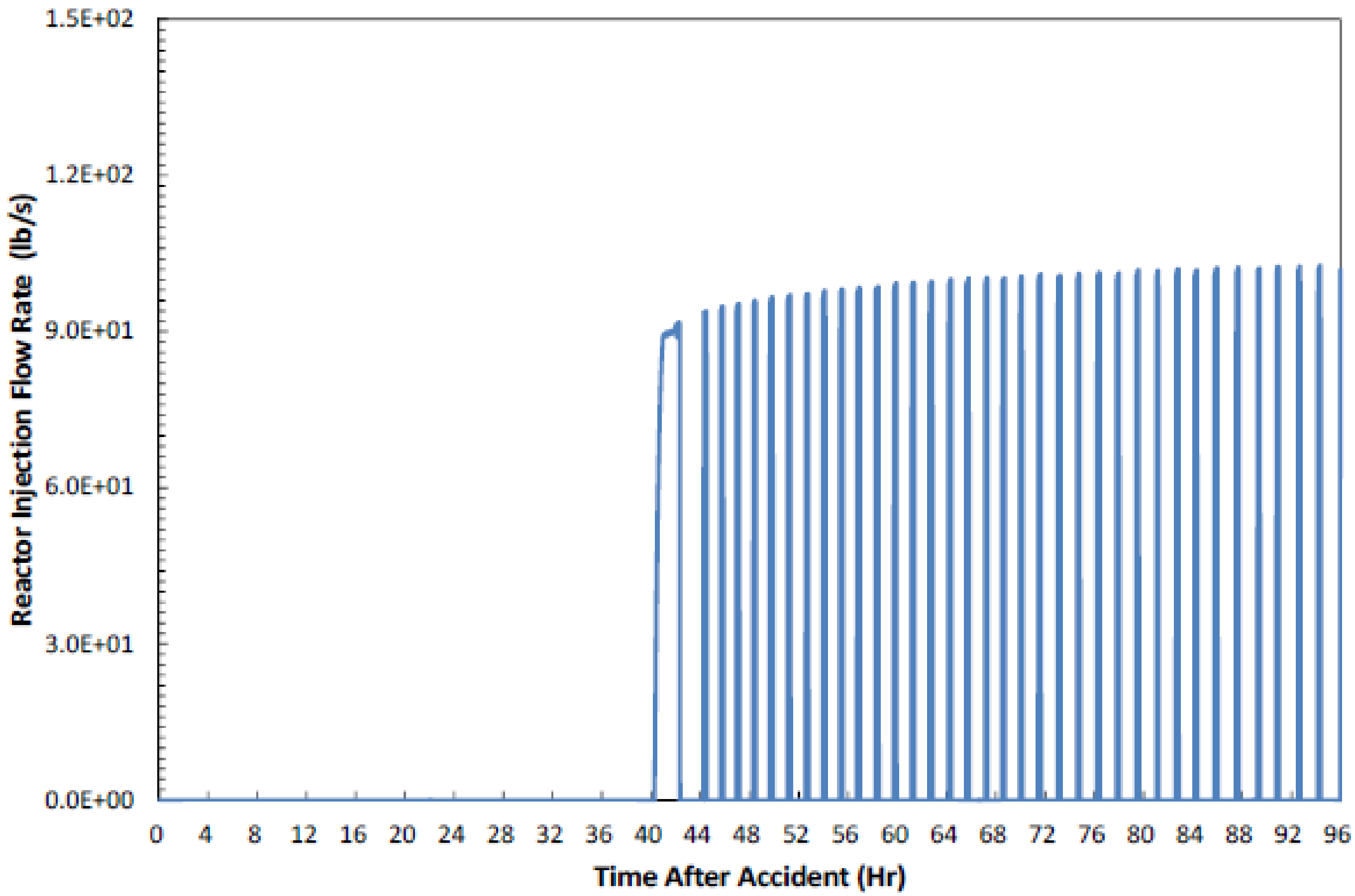


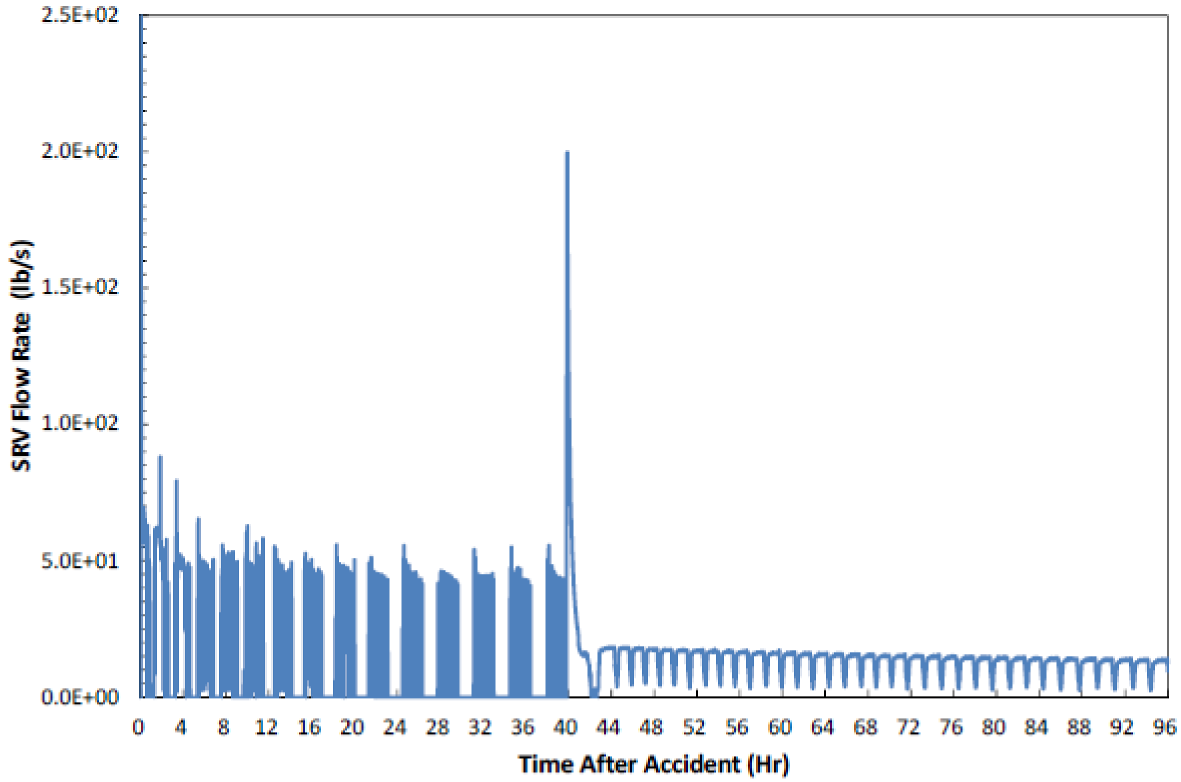

4.0E+01
3.5E+01
3.0E+01
2.5E+01
2.0E+01
1.5E+01
1.0E+01
5.0E+00
0.0E+00
Containment Water Level (ft)
Lower Drywell
Wetwell
Rupture Disc Open (COPS)
One SRV Manually Open
Top Vent
W/W Floor
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
Time (hours)

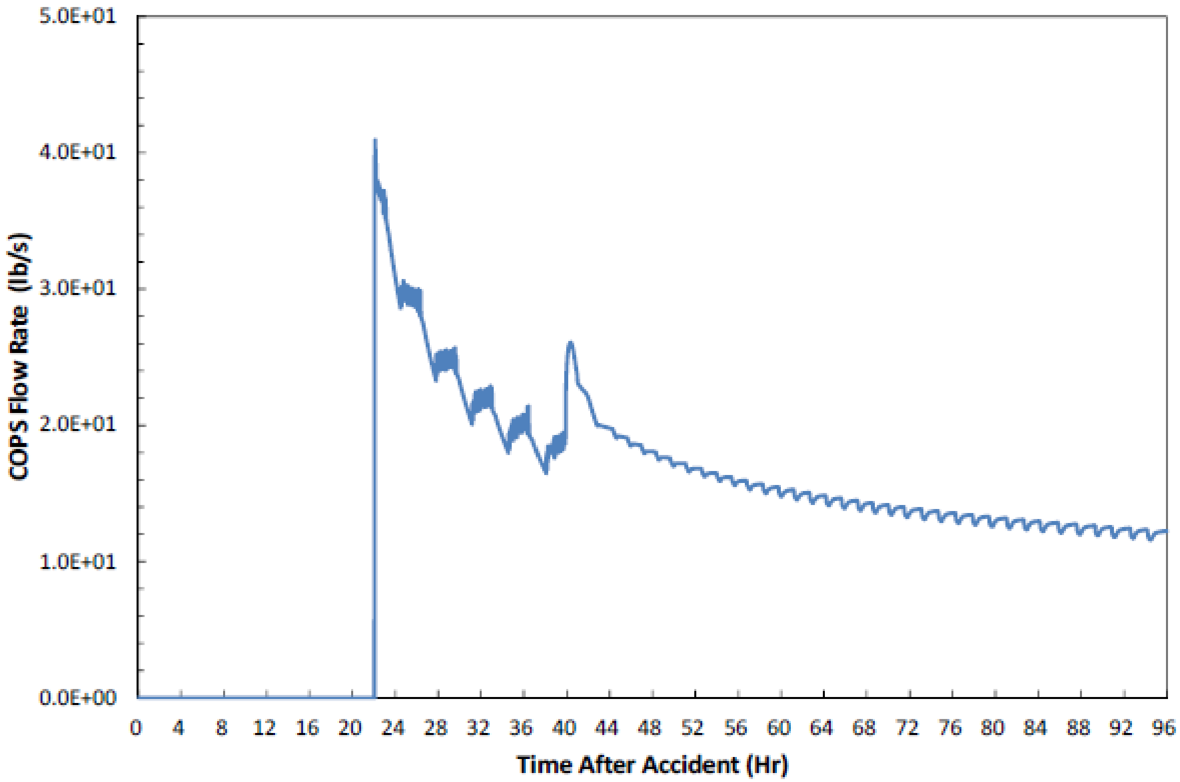
MAAP Reactor Pressure



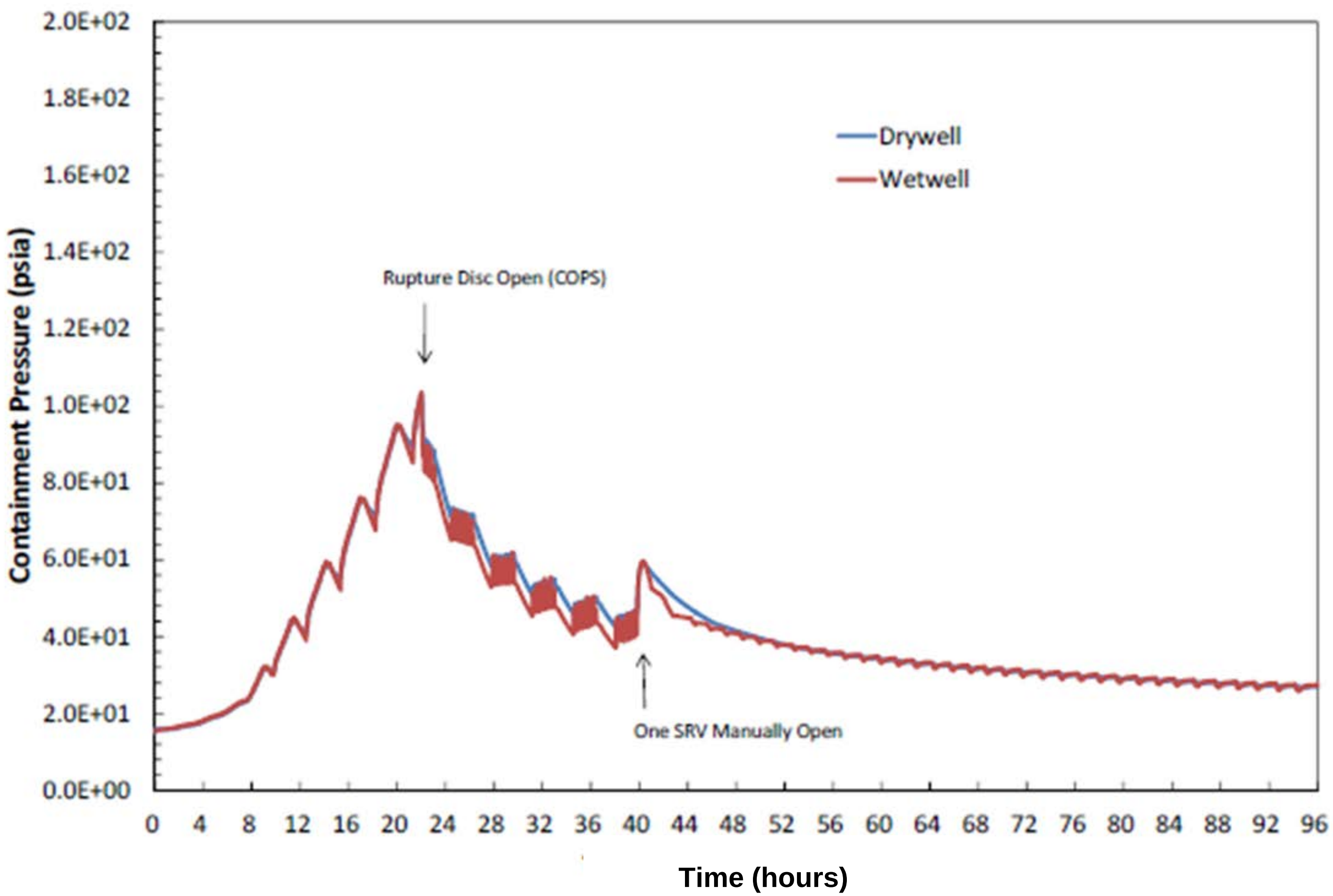

1.5E+02
1.2E+02
9.0E+01
6.0E+01
3.0E+01
0.0E+00
Reactor Injection Flow Rate (lb/s)
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
Time After Accident (Hr)

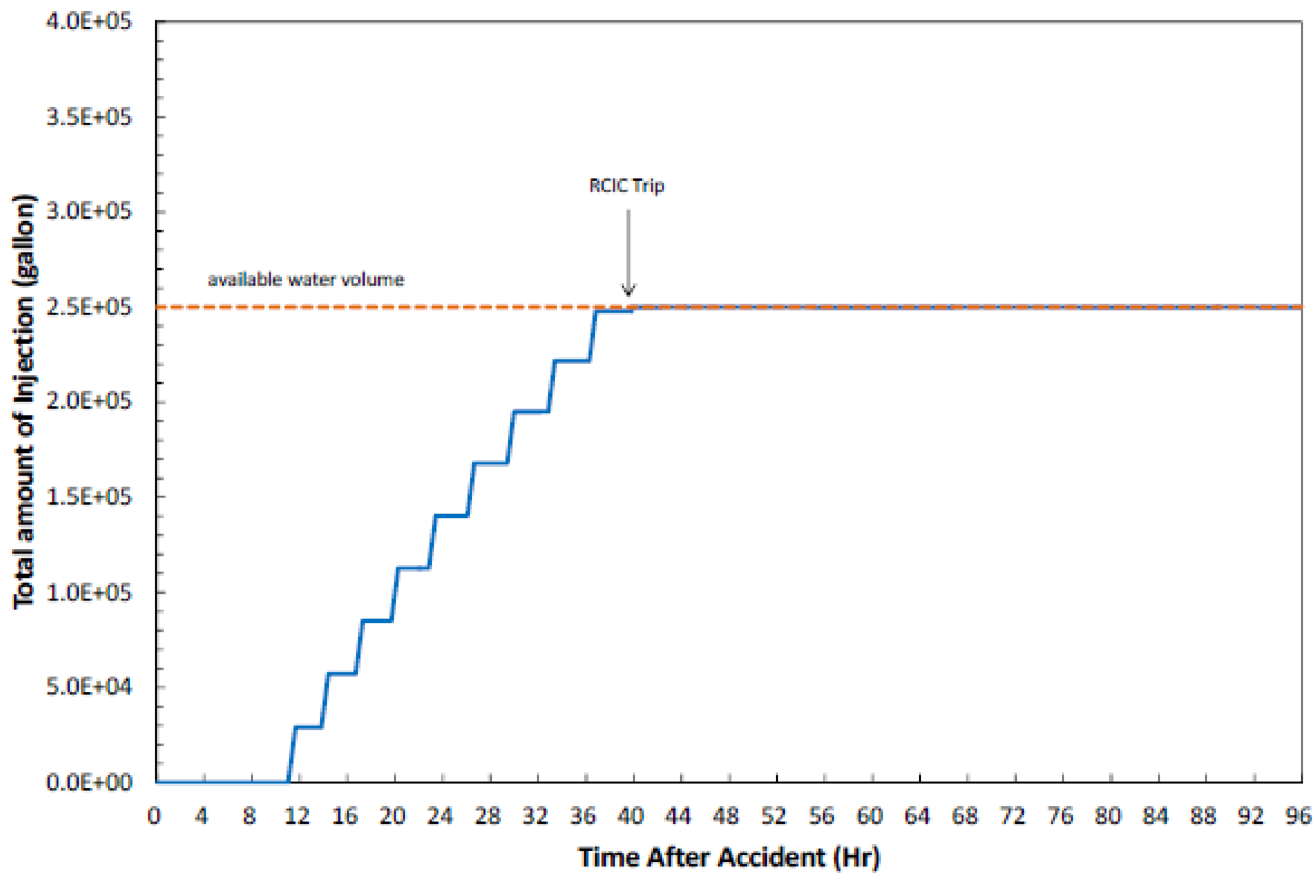

1.5E+02
1.2E+02
9.0E+01
6.0E+01
3.0E+01
0.0E+00
Reactor Injection Flow Rate (lb/s)
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
Time After Accident (Hr)

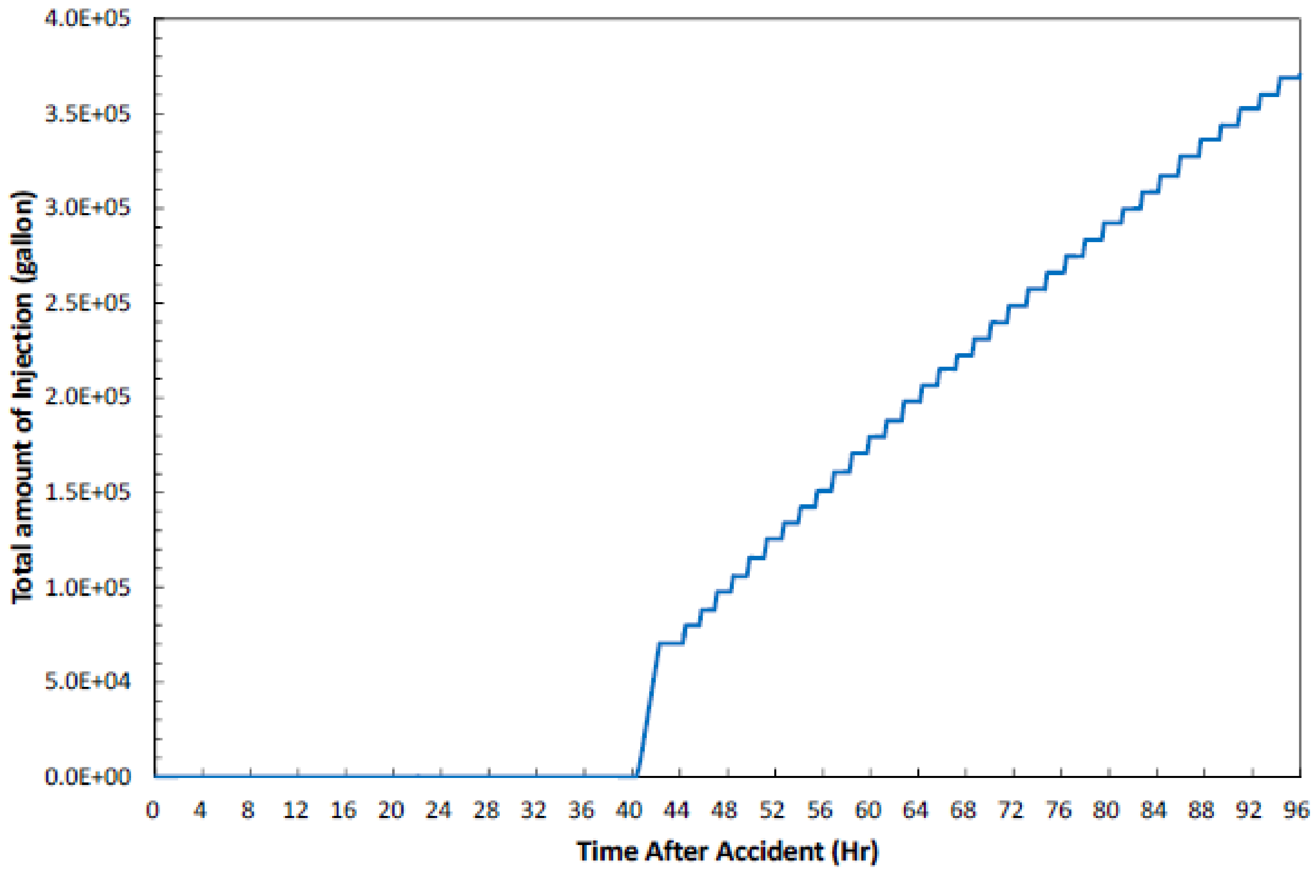

2.5E+02
2.0E+02
1.5E+02
1.0E+02
5.0E+01
0.0E+00
SRV Flow Rate (lb/s)
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
Time After Accident (Hr)


5.0E+01
4.0E+01
3.0E+01
2.0E+01
1.0E+01
0.0E+00
COPS Flow Rate (lb/s)
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
Time After Accident (Hr)

MAAP Containment Pressure




4.0E+05
3.5E+05
3.0E+05
2.5E+05
2.0E+05
1.5E+05
1.0E+05
5.0E+04
0.0E+00
Total amount of Injection (gallon)
RCIC Trip
available water volume
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
Time After Accident (Hr)



4.0E+05
3.5E+05
3.0E+05
2.5E+05
2.0E+05
1.5E+05
1.0E+05
5.0E+04
0.0E+00
Total amount of Injection (gallon)
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
Time After Accident (Hr)

ABWR Simulator

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

STP 3&4 FLEX Plan – Sequence of Events *(continued)*

Long Term Actions:

- Restore normal AC service via EDGs or CTGs
- 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

OPEN PHASE CONDITION Backups

Important Aspects of STP 3&4 Design Relative to an Open Phase Condition

- Three separate offsite connections - Main Power Transformer (MPT) and two Reserve Auxiliary Transformers (RAT) for each unit
- No automatic bus transfer schemes
- Each unit has a Combustion Turbine Generator (CTG)
- Can cross-tie to other unit

STP 3&4 Licensing Approach for Open Phase Condition

1. Detection of Open Phase (and Control Room Alarm) on the high-voltage side of MPT, RAT-A, and RAT-B
   - Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) for Open Phase Detection and Alarm
2. Protection of Class 1E 4.16 kV busses with Negative Sequence Voltage Relays
   - Actuation opens bus supply breakers
   - Undervoltage (UV) relays actuate causing Emergency Diesel Generator (EDG) start and pick up of load
   - Negative Sequence Voltage Relays are added to Technical Specifications (TS)

Open Phase Detection and Alarm

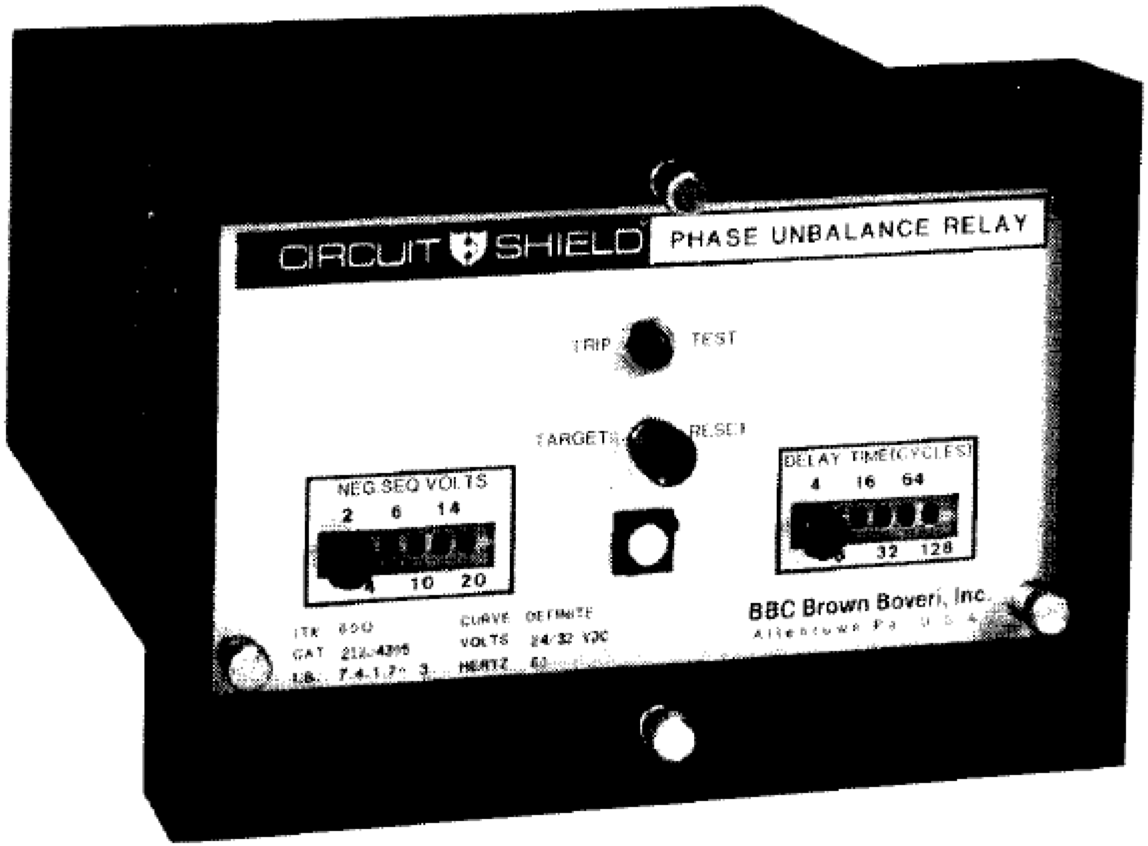
- Detection on the high-voltage side of the MPT and both RATs
- Alarm in Main Control Room
- Procedures will direct the operator response

Open Phase Protection

- Class 1E Negative Sequence Voltage Relays provide protection for the three Class 1E 4.16 kV busses
- Designed to protect motors from overheating due to unbalanced voltage and current
- Relays monitor negative sequence voltage for each phase
  - 3 relays for each bus
  - 2 out of 3 logic

Open Phase Protection *(continued)*

Negative Sequence Voltage Relay



Open Phase Protection *(continued)*

- Design Negative sequence voltage of 5.0%
  - Value at which motors can operate continuously with no adverse consequences
- Design time delay of 3.0 seconds
  - Ensures that relays do not actuate as a result of normal system transients
- Final setpoint and time delay values will be in accordance with Setpoint Control Program
  - Current nominal setpoint values are 4.5% and 2.5 seconds

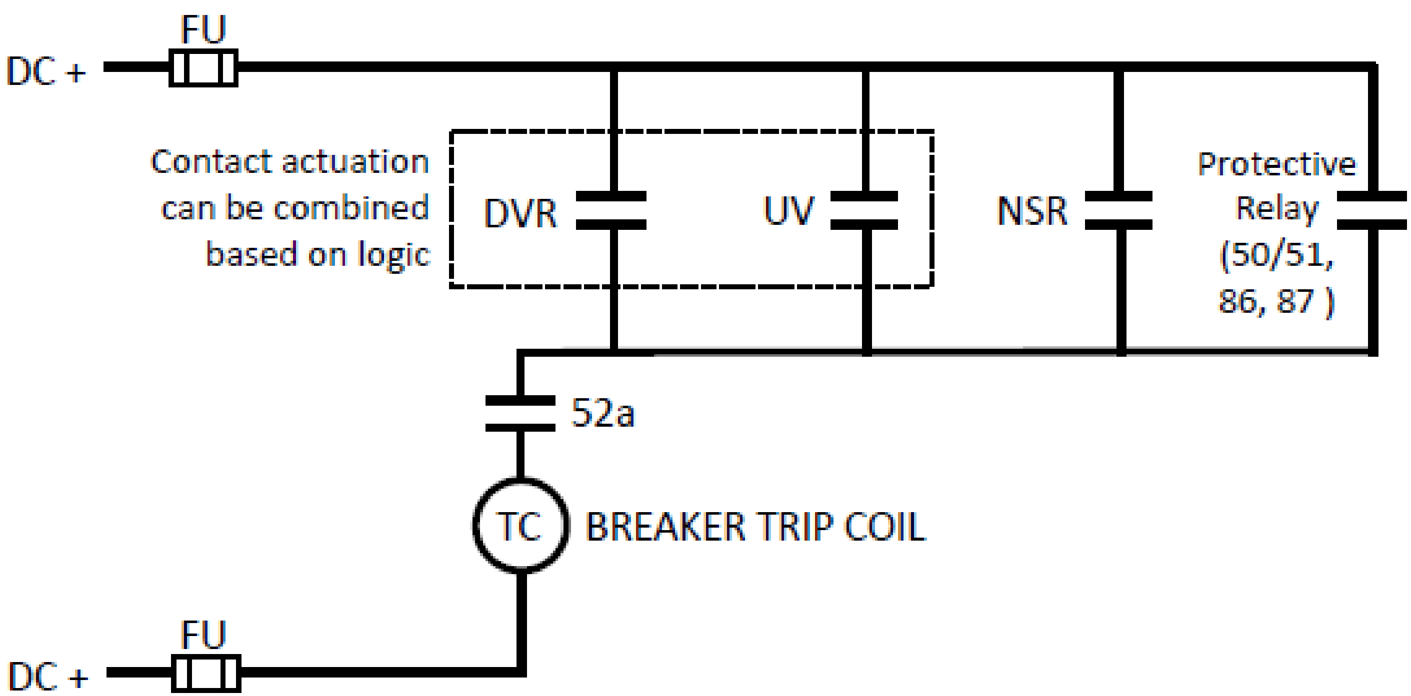
Open Phase COLA Changes

- Open Phase Detection and Alarm added to FSAR Section 8.2 (Offsite Power Systems)
- Negative Sequence Voltage Relays added to FSAR Section 8.3 (Onsite Power Systems)
- Negative Sequence Voltage Relays added to TS 3.3.1.4, ESF Actuation Instrumentation
  - Same surveillances as UV and Degraded Voltage Relays
- Site-specific ITAAC for the Open Phase Detection and Alarm
- No other changes to COLA

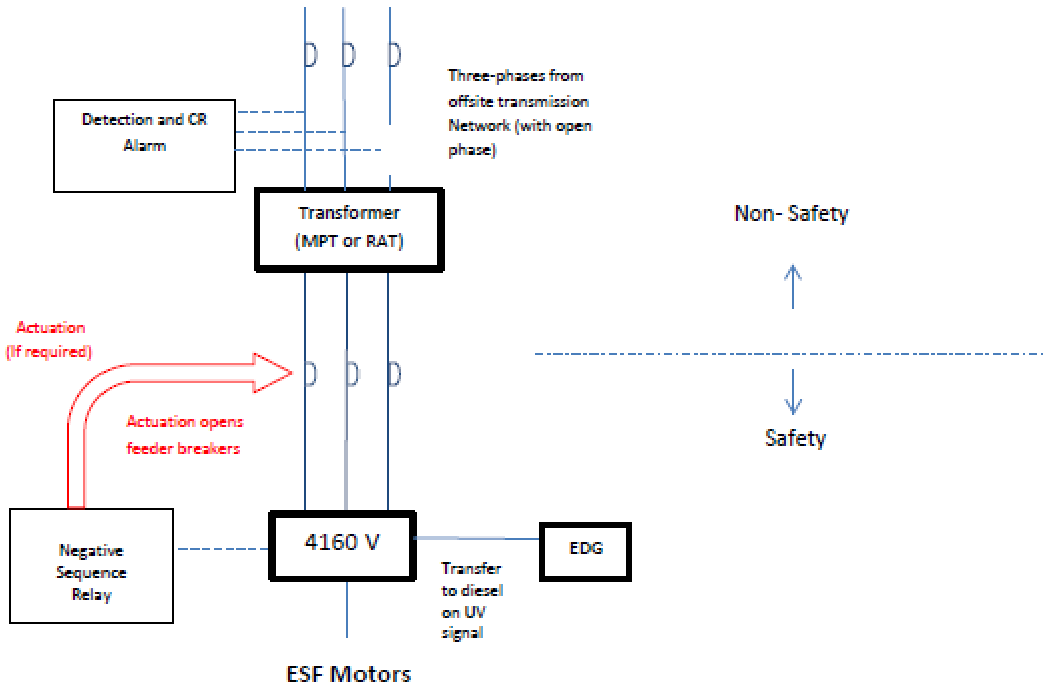
Conclusions

- Addition of open phase detection/alarm and Class 1E 4.16 kV protection enhance an already robust design
- ITAAC will ensure the open phase detection and alarm meet design requirements
- TS surveillances will ensure negative sequence relays remain reliable for their protective function

STP 3&4 Open Phase Solution



STP 3&4 Open Phase Solution



ACTUATION –YES (if required)

Tech Specs - YES

Probabilistic Risk Assessment

- PRA analysis was performed in accordance with our change process to determine if the negative sequence relays impacted the STP 3&4 PRA and Chapter 19
- Three cases analyzed
- Risk associated with an open phase event is very small even without additions to the design
- Risk associated with an open phase is even smaller with negative sequence relays added
- Analysis screened out from requiring a change to Chapter 19 or PRA model

Detailed Risk Analysis

Open Phase Cases	CCDP	CDF
No operator action to diagnose presence of open phase	9.4×10^{-7}	9.4×10^{-9}
MPT recreates voltages	1.1×10^{-8}	1.1×10^{-10}
Open phase detection and negative sequence protection added to design	1.7×10^{-7}	1.7×10^{-9}

ETAP Analyses

- A series of analyses were performed using ETAP
- Over 20 cases analyzed
  - At Power
  - Shutdown
  - Fully loaded buses
  - Lightly loaded buses
  - Startup of a large motor
  - During diesel testing
- ETAP checked against other industry code

Typical Scenario – Automatic and Manual Actions

Generator On-line – Power Operation Open Phase on MPT
Automatic Actions
Open phase on the high voltage side of the MPT (Phase A)
Open phase alarms in Main Control Room
Division I and II Class 1E 4.16 kV busses experience a negative sequence voltage > 4.5%
After a 2.5 second time delay, the negative sequence relay opens the feeder breakers to the Division I and II 4.16 kV busses
Division I and II busses reach undervoltage (UV) setpoint
After a 3 second time delay, EDGs on Division I and II start
When EDGs reach full speed, the Loss Of Off-site Power (LOOP) sequencer connects the appropriate Division I and II loads onto their EDG
Operator Actions
Based on the open phase alarm, operators start to implement their response procedure
Once the open phase alarm is confirmed, the operators enter TS 3.8, Electrical Power Systems
The procedure guides operators to transfer the Class 1E 4.16 kV busses to an unaffected source of offsite power
Once the transfer is successful, the EDGs are secured and TS 3.8 Limiting Condition for Operation (LCO) is exited
Troubleshooting and maintenance take place on the MPT open phase

ITAAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Continuous monitoring of the power feeds on the high voltage side of the Main Power Transformer (MPT) and Reserve Auxiliary Transformers (RAT) is provided to detect: a. An open phase with no transformer high-side ground. b. An open phase with a transformer high side ground between the open phase and the transformer. c. Two transformer high side open phases (simultaneously).	1. An analysis of the transformer relay scheme will be performed to verify the following: a. Relay current transformers have been correctly located. b. Relay set points can provide adequate detection.	1. An analysis demonstrates: The correct location of the current transformers for the MPT and RATs transformer relays. Relay set points ensure that the monitoring systems can adequately detect open phase conditions in any combination of three phases, with or without accompanying ground faults, on the high-voltage side of the MPT and RATs transformers.

ITAAC *(continued)*

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
2.The monitoring system provides a Main Control Room Alarm for: a. An open phase with no transformer high-side ground. b. An open phase with a transformer high side ground between the open phase and the transformer. c. Two transformer high side open phases (simultaneously).	2. A test will be performed of the as-built monitoring system, using simulated signals, to demonstrate that, at the designated relay set points, the MPT and RATs alarm in the Main Control Room.	2. Using simulated signals, at the designated relay set points in any combination of the three phases, the as-built MPT and RATs initiate an alarm in the Main Control Room.

Nuclear Innovation North America LLC

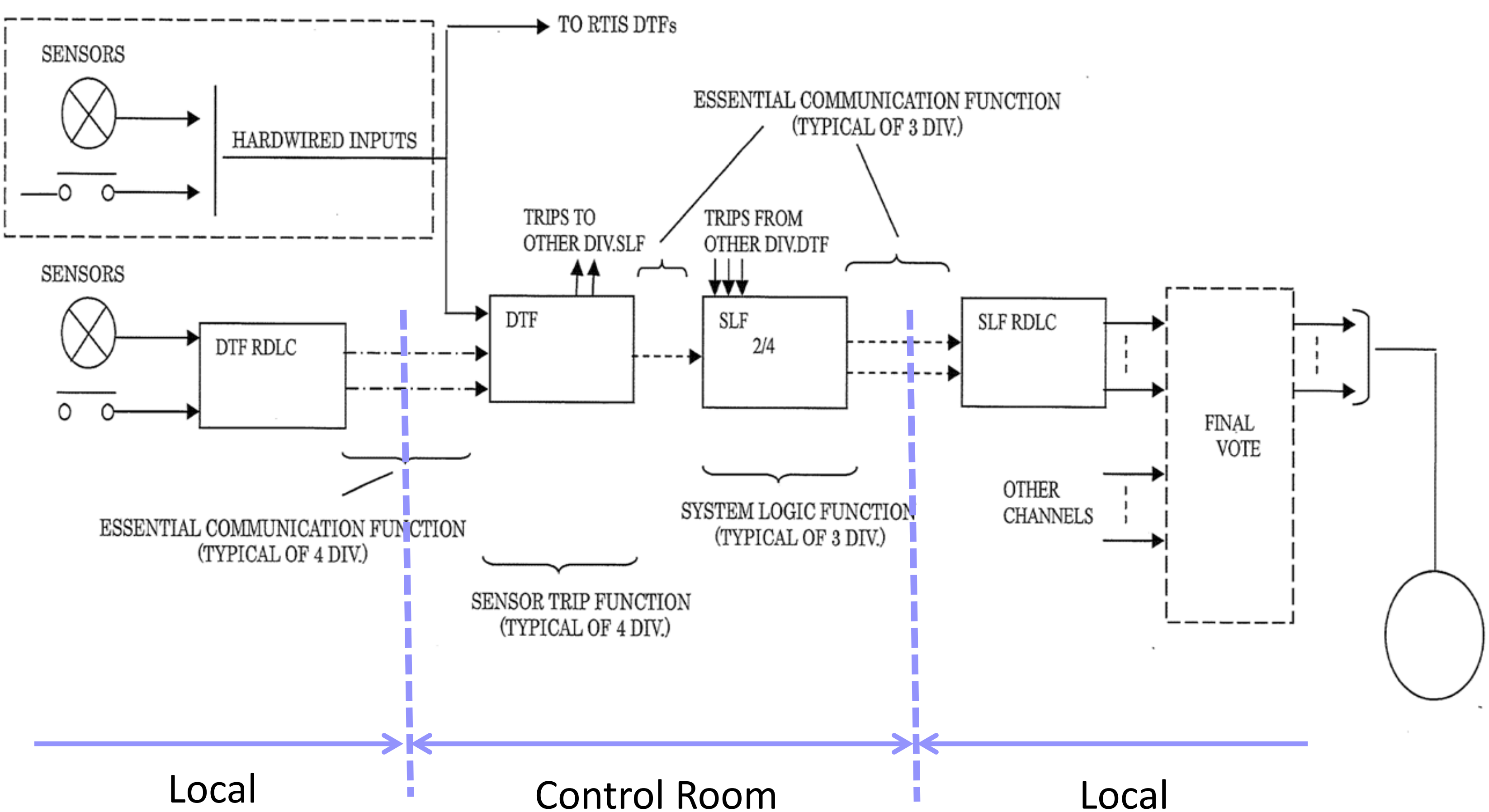
FIRE INDUCED SPURIOUS SIGNALS

Backups

Fire Induced Spurious Signals

- The Engineered Safety Features (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.

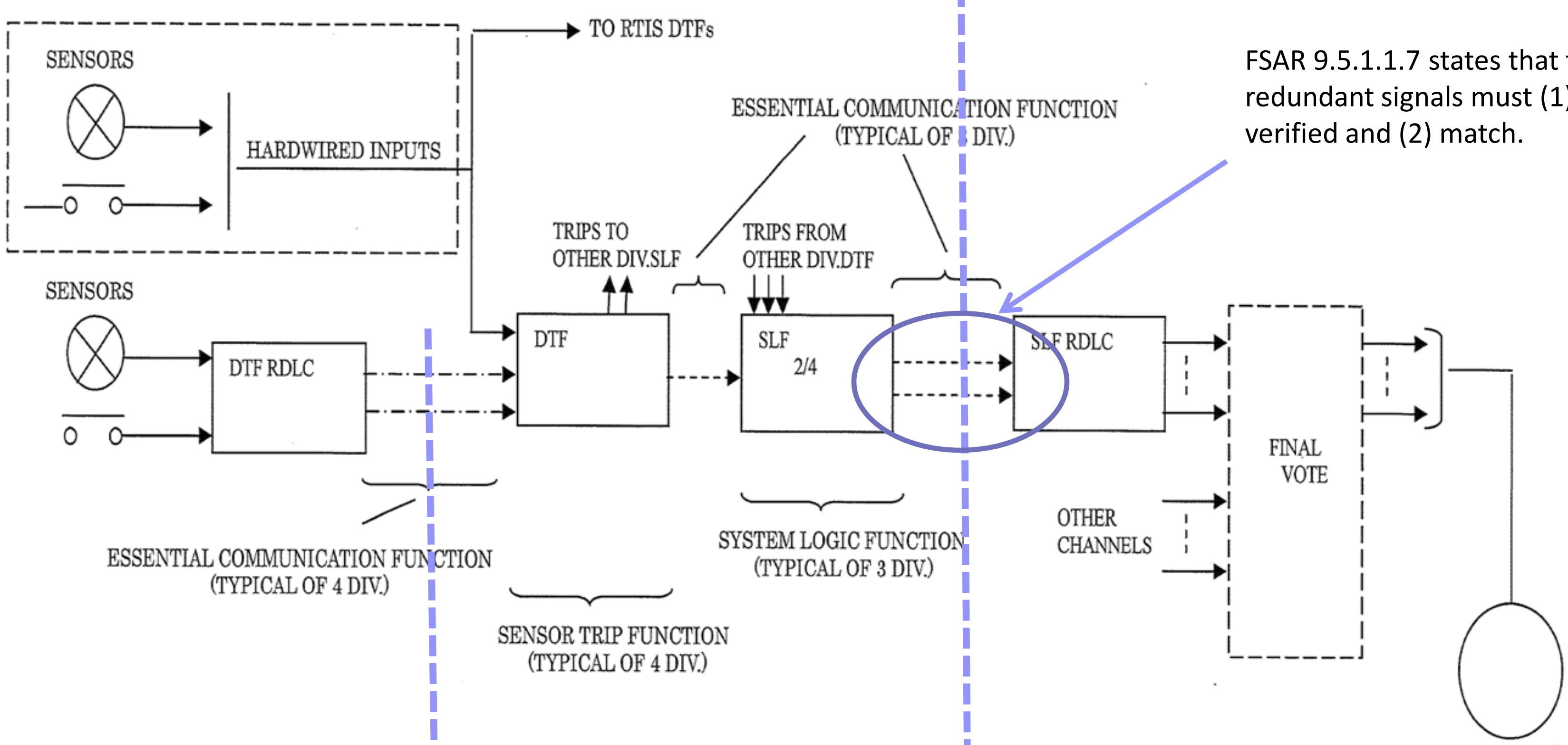
ESF Logic and Controls System (ELCS) Block Diagram



ESF Logic and Controls System (ELCS) Block Diagram

NEI 00-01 Applies

FSAR 9.5.1.1.7 states that the redundant signals must (1) be verified and (2) match.



Local | Control Room | Local

Generic Letter (GL) – Treatment of Natural Phenomena Hazards in Fuel Cycle Facilities

February 5, 2015

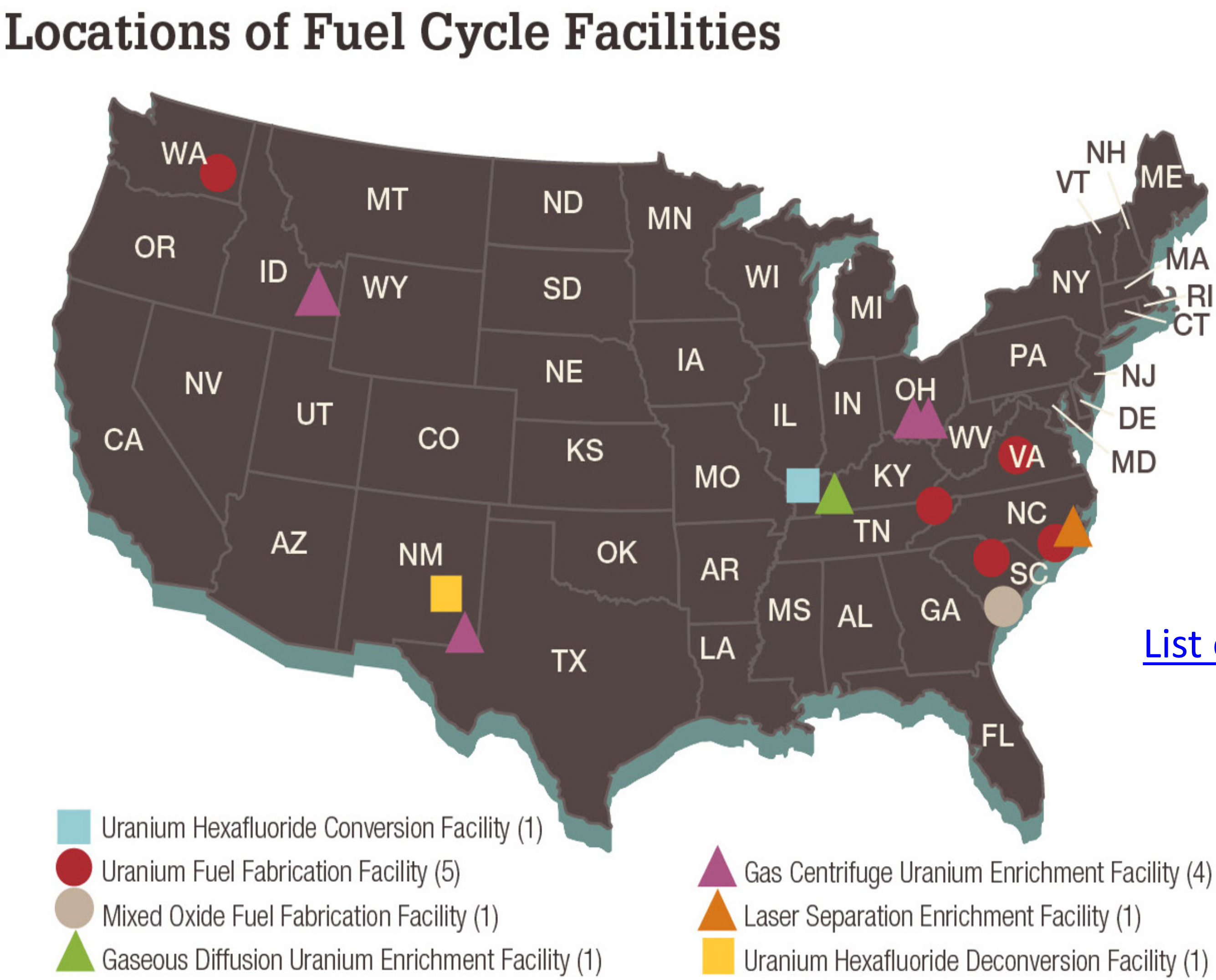
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Overview of Fuel Cycle Facilities

Mollie Semmes
NMSS/FCSE

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Overview of Fuel Cycle Facilities (Cont.)



List of Facilities

Overview of Fuel Cycle Facilities (Cont.)

- Regulatory Framework
  - 10 CFR Part 40
    - Conversion
    - Deconversion
  - 10 CFR Part 70
    - Enrichment
    - Fuel Fabrication
  - 10 CFR Part 76
    - Gaseous Diffusion Plant

Overview of Fuel Cycle Facilities (Cont.)

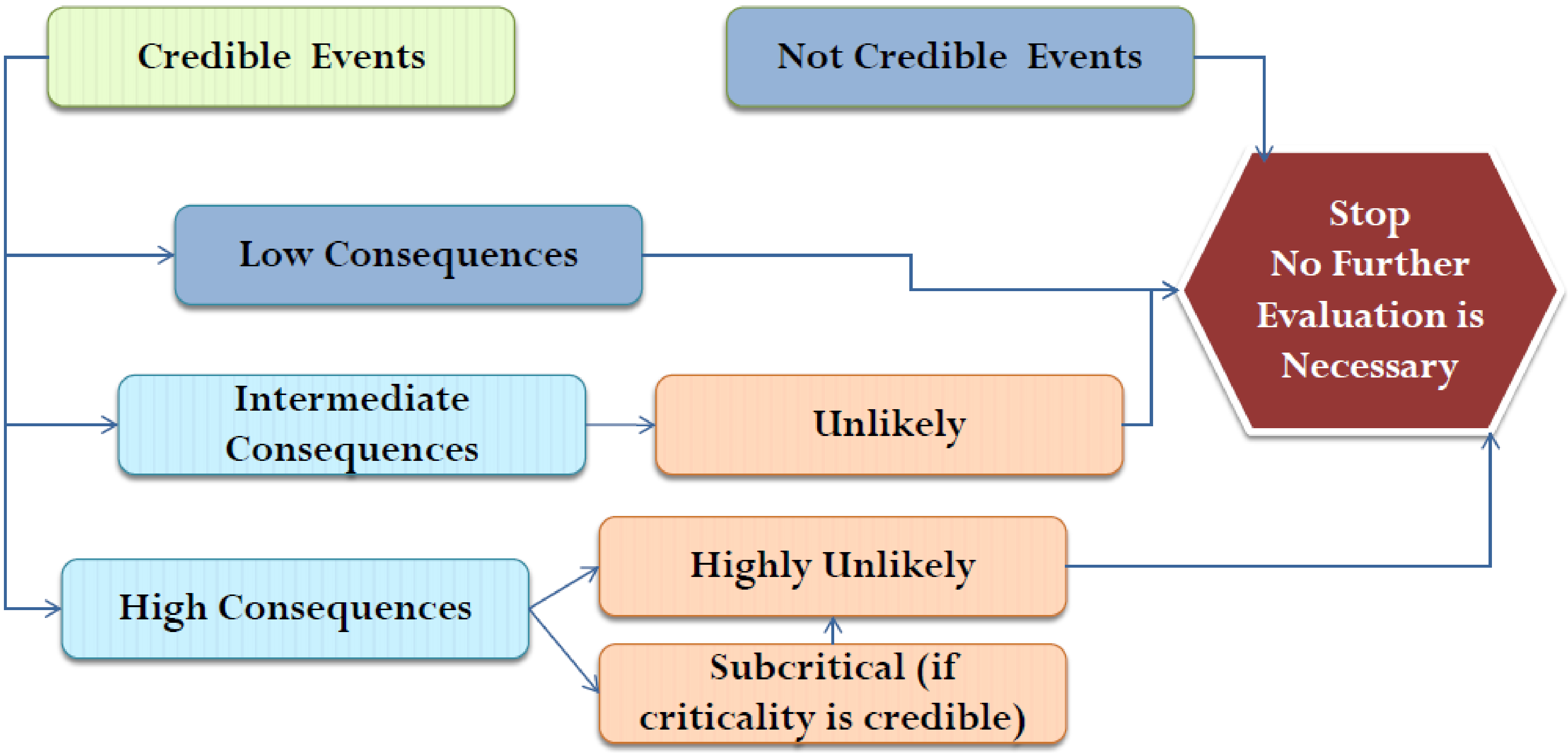
- Fuel Cycle Facilities Predominant Hazards
  - Uranium Hexafluoride (UF_6) and Hydrogen Fluoride (HF) releases resulting from UF_6 interaction with moisture
  - Fires
  - Criticality Events
  - Chemical Exposures (ammonia, etc.)
  - Exposure hazards from soluble uranium
  - Facilities not affected by station black out and multiunit events

Overview of Fuel Cycle Facilities (Cont.)

- Regulatory Framework
  - 10 CFR Part 70
    - Amended in September 2000 to incorporate Subpart H performance-based and risk-informed integrated safety analysis (ISA)
      - Performance Requirements (70.61)
      - ISA (70.62(c))
      - Identification of items relied on for safety (IROFS) (70.62(c)(vi)) (70.61(d))
      - Management Measures (70.62(d))
      - Baseline design criteria (70.64) for new facilities/process

Overview of Fuel Cycle Facilities (Cont.)

- 10 CFR 70.61 Performance Requirements



Post-Fukushima Actions at Fuel Facilities

Jonathan Marcano, P.E.
NMSS/FCSE

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Actions at Fuel Facilities

- Information Notice 2011-08
  - Issued May 31, 2011
    - Informs fuel cycle facilities of the potential challenges when preventing or mitigating the effects of natural phenomena events
    - Suggests that facilities review and consider actions, as appropriate, to ensure that features and preparations necessary to withstand or respond to severe external events from natural phenomena (e.g., earthquakes, tsunami, floods, tornadoes, and hurricanes) are reasonable

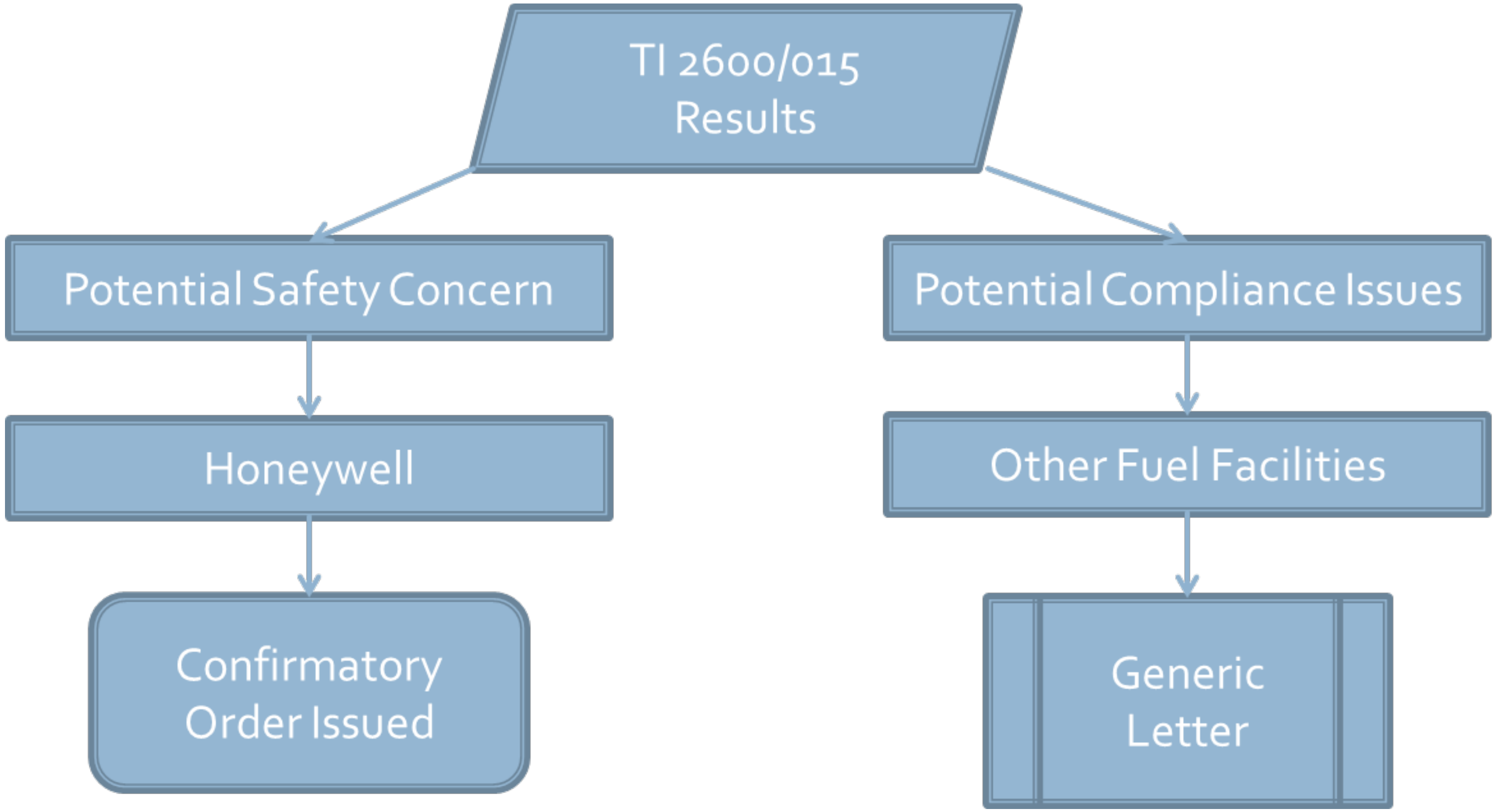
Actions at Fuel Facilities

- Temporary Instruction (TI) 2600/0015
  - Issued on September 30, 2011
    1) Verify that the licensees' mitigation strategies for each of the licensing basis events are:
       - Properly implemented
       - Prevention and/or mitigation strategies appropriate for the consequences
    2) Licensing basis events:
       - Seismic hazards
       - Flooding hazards
       - Wind and tornado loading
       - Extended loss of power and emergency power
       - Fire impacts
    3) Evaluate the adequacy of emergency prevention and/or mitigation strategies for consequences of selected beyond licensing basis events

Actions at Fuel Facilities

- Facilities Inspected under TI 2600/0015
  - Paducah Gaseous Diffusion Plant in Paducah, KY
  - AREVA NP, Inc. in Richland, WA
  - Westinghouse Electric Co., in Columbia, SC
  - Babcock & Wilcox Nuclear Owners Group (BWNOG) in Lynchburg, VA
  - Nuclear Fuel Services in Erwin, TN
  - Global Nuclear Fuel – Americas in Wilmington, NC
  - Honeywell International in Metropolis, IL
- Facilities not inspected
  - Louisiana Energy Services, NM
  - Other new facilities not yet in operation (Mixed Oxide Fuel Fabrication Facility, USEC American Centrifuge Plant, AREVA Eagle Rock, GE Global Laser Enrichment and International Isotopes)

Actions at Fuel Facilities



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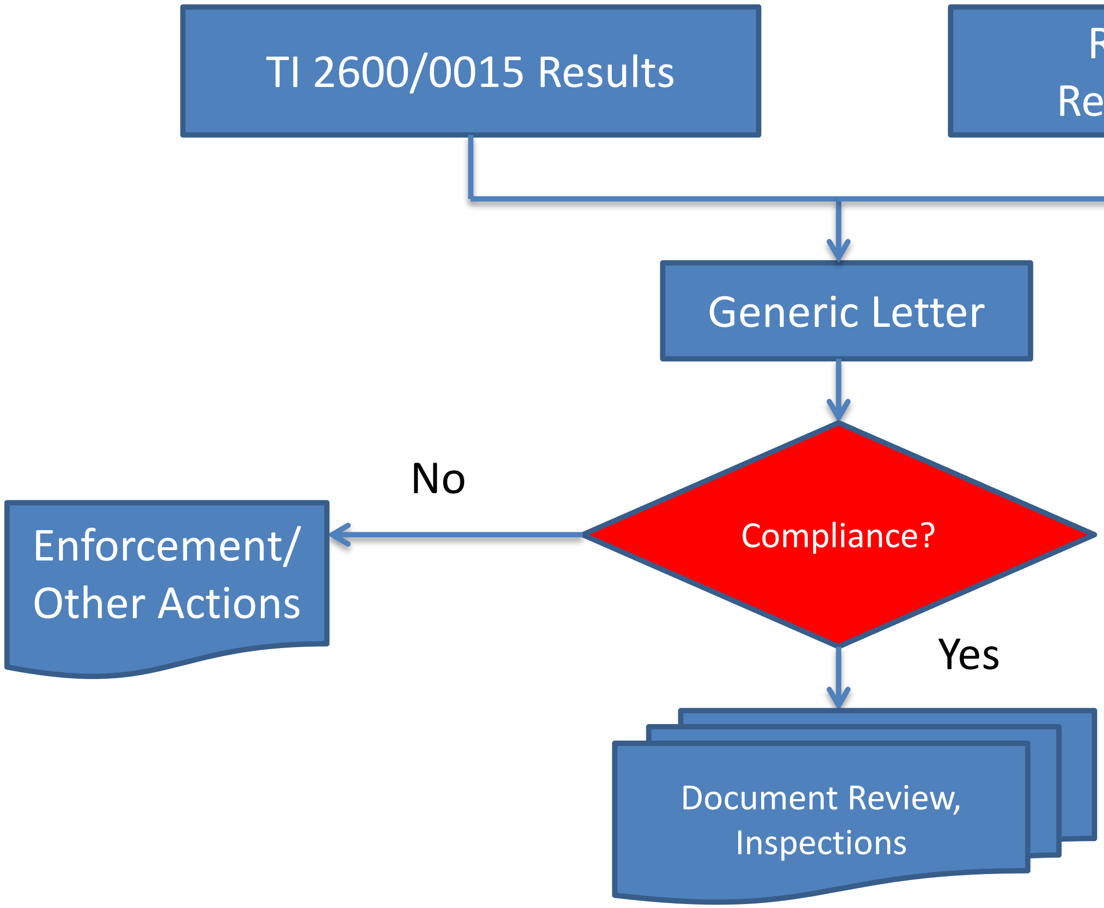
Actions at Fuel Facilities

- Review of Near Term Task Force (NTTF) Recommendations
  - Coordinated through the JLD Steering Committee
  - Systematic approach to review applicability for Fuel Facilities
    - Reviewed against conditions referenced in the report
    - Incorporates findings and lessons from TI 2600/015
    - Incorporates path forward to address TI issues
  - No immediate actions identified

Generic Letter



Generic Letter

- Purpose:
  - Request for information to verify compliance with regulations regarding natural phenomena hazards effects (e.g. earthquake, high winds)
- Outcome:
  - Verify the basis and documentation of how the facility provides for the adequate protection of the public health and safety under natural phenomena hazard (NPH) events

Generic Letter (Cont.)

- Information collection (90 days)
  - Definitions of "unlikely," "highly unlikely," and "credible" for NPH events
  - Integrated Safety Analysis
    - Likelihood & Magnitude
    - Accident sequences
    - Consequences (performance requirements)
    - Items Relied on for Safety
  - Description of changes to hazards applicable to site with facility design basis
  - Summary of the results of any walk downs (e.g. evaluation of degraded conditions)

Generic Letter (Cont.)

- Additional information (180 days)
  - If a need to change the facility safety assessment is identified
    - Evaluation basis event used (magnitude & likelihood)
    - Safety margin evaluation and/or mitigation strategies
    - If applicable, submit proposed modifications

Summary

- Systematic evaluation of fuel cycle facilities identified generic issues regarding compliance with current regulatory framework for natural phenomena hazards (NPH).
- Generic Letter to collect information to verify compliance with license conditions and regulations.
- Validation of assumptions of how the facility provides adequate protection under NPH events.

Background Slides

Overview of Fuel Cycle Facilities (Cont.)

Major U.S. Fuel Cycle Facility Sites

Licensee	Location	Status	Docket #
Uranium Hexafluoride Conversion Facility			
Honeywell International, Inc.	Metropolis, IL	active	04003392
Uranium Fuel Fabrication Facilities			
Global Nuclear Fuel-Americas, LLC	Wilmington, NC	active	07001139
Westinghouse Electric Company, LLC Columbia Fuel Fabrication Facility	Columbia, SC	active	07109239
Nuclear Fuel Services, Inc.	Erwin, TN	active	07000143
Babcock & Wilcox Nuclear Operations Group	Lynchburg, VA	active	07000027
AREVA NP, Inc.	Richland, WA	active	07001257
Mixed Oxide Fuel Fabrication Facility			
Shaw AREVA MOX Services, LLC	Aiken, SC	under construction (operating license under review)	07003098
Gaseous Diffusion Uranium Enrichment Facilities			
USEC, United States Enrichment Corp. Paducah Gaseous Diffusion Plant	Paducah, KY	shutdown, certificate termination pending	07007001
Gas Centrifuge Uranium Enrichment Facilities			
USEC, American Centrifuge Operating, LLC Lead Cascade: Test and Demonstration Facility	Piketon, OH	Active	07007003
USEC, American Centrifuge Operating, LLC American Centerfuge Plant	Piketon, OH	license issued, construction halted	07007004
Louisiana Energy Services (URENCO-USA)	Eunice, NM	active*	07003103
AREVA Enrichment Services, LLC Eagle Rock Enrichment Facilities	Idaho Falls, ID	license issued, construction not started	07007015
Laser Separation Enrichment Facility			
GE-Hitachi	Wilmington, NC	license issued, construction not started	07007016
Uranium Hexafluoride Deconversion Facility			
International Isotopes	Hobbs, NM (Lea County)	license issued, construction not started	04009086

Overview of Fuel Cycle Facilities (Cont.)

70.61 Performance Requirements	Highly Unlikely	Unlikely	Not Unlikely
High Consequence Publ Dose > 25 rem Worker Dose > 100 rem Publ U intake > 30 mg Publ Chem: Irreversible+LongLasting Worker Chem : Endanger life	Acceptable	Not Acceptable	Not Acceptable
Intermidiate Consequence Publ Dose 5 - 25 rem Worker Dose 25 - 100 rem Publ Chem: Mild Transient effects Worker Chem:Irrever+LongLasting Env releases > 5000 Tbl 2 10CFR 20	Acceptable	Acceptable	Not Acceptable
Low Consequense Publ Dose < 5 rem Worker Dose < 25 rem	Acceptable	Acceptable	Acceptable
Under normal and abnormal conditions: Nuclear process must remain subcritical			

Overview of Fuel Cycle Facilities (Cont.)

- 10 CFR Part 70 (Cont.)
  - Licensees required to meet Subpart H:
    - Operating:
      - » AREVA, Richland, WA
      - » Westinghouse, Columbia, SC
      - » Global Nuclear Fuel, Wilmington, NC
      - » NFS, Erwin, TN
      - » BWXT, Lynchburg, VA
      - » LES, New Mexico
    - Construction/Waiting to start construction
      - » MOX, Aiken, SC
      - » USEC, American Centrifuge, Piketon, OH
      - » AREVA Eagle Rock,
      - » GE-Hitachi Laser Enrichment

Overview of Fuel Cycle Facilities (Cont.)

– 10 CFR Part 40
  - 40.31(j)(1)(ii) which requires, in part, an emergency plan for responding to the radiological hazards of an accidental release of source material and to any associated chemical hazards directly incident thereto.
  - 40.31(3)(ii) Types of accidents, which requires identification of each type of accident sequences for which protective actions may be needed.
  - Major 2 facilities incorporate ISA provisions similar to 10 CFR Part 70 through license conditions

Overview of Fuel Cycle Facilities (Cont.)

- Licensees required to meet Part 40:
  - Honeywell, Metropolis IL
  - International Isotopes, NM
    - » SECY 07-146 directed staff to require implementation of ISA requirements in Part 70 Subpart H

Overview of Fuel Cycle Facilities (Cont.)

- 10 CFR Part 76
  - 76.35 (a)(6) which requires, in part, that the application must include a SAR with a description of equipment and facilities which will be used by the Corporation to protect health and minimize danger to life or property
  - 76.85 which requires, in part, an analysis of potential accidents and consequences from a reasonable spectrum of postulated accidents which include internal and external events and natural phenomena in order to ensure adequate protection of the public health and safety
  - Certificate holder required to meet Part 76
    - Paducah GDP in Paducah, KY (Shutdown)

Overview of Fuel Cycle Facilities (Cont.)

- Conversion
  - Preparing Uranium (U) for Enrichment
  - Honeywell International in Metropolis, IL
    - Input: yellowcake in 55-gallon drums
    - Output: UF_6 in 14-ton cylinders
- Deconversion
  - International Isotopes Inc.
    - Input: Depleted UF_6
    - Output: High purity fluoride gas and UO_2F_2 for disposal

Overview of Fuel Cycle Facilities (Cont.)

- Enrichment
  - Boosting concentration of U^{235} (0.71% $\rightarrow$ 5%)
    - Input: Natural UF_6
    - Product: Low-Enriched UF_6
  - Gaseous diffusion plant:
    - Paducah GDP in Paducah, KY (Shutdown)
  - Laser enrichment facility
    - GE Hitachi in Wilmington, NC (Licensed, construction on hold)

Overview of Fuel Cycle Facilities (Cont.)

- Enrichment (Cont.)
  - Gas centrifuge plants:
    - LES – National Enrichment Facility in Eunice, NM (operation and construction)
    - USEC – Lead Cascade Test, Facility and American Centrifuge Plant in Piketon, OH (Licensed, construction on hold)
    - AREVA – Eagle Rock Facility in Bonneville County, ID (Licensed, construction on hold)

Overview of Fuel Cycle Facilities (Cont.)

- Fuel Fabrication
  - Produce low-enriched uranium (LEU) in the form of UO_2, or Mixed Oxide (MOX)
  - Facilities:
    - AREVA NP, Inc. in Richland, WA
    - Global Nuclear Fuel – Americas in Wilmington, NC
    - Westinghouse Electric Co., in Columbia, SC
    - Mixed Oxide Fuel Fabrication Facility in Savannah River Site, SC (Construction)

Overview of Fuel Cycle Facilities (Cont.)

- High-Enriched Uranium (HEU) Facilities
  - Enrichment typically involves > 90 wt % ^{235}U
  - Support naval nuclear propulsion program and research reactors
  - HEU fuel facilities
    - Nuclear Fuel Services in Erwin, TN
    - Babcock & Wilcox Nuclear Owners Group (BWNOG) in Lynchburg, VA

Actions at Fuel Facilities

- TI Inspection Reports:
  - Honeywell (ML12222A163)
  - Paducah (ML12131A437)
  - AREVA (ML12122A094)
  - B&W NOG (ML12121A574)
  - Global Nuclear Fuel – Americas (ML12209A276)
  - Nuclear Fuel Services (ML12122A186)
  - Westinghouse – Columbia Fuels (ML12122A083)

Actions at Fuel Facilities

- Honeywell Confirmatory Order Corrective Actions
  - Evaluation of external events and safety basis
  - Implementation of modifications
  - Develop and implement quality assurance measures for the modifications
  - Revised Emergency Response Plan and onsite emergency exercise
  - Revised ISA Summary

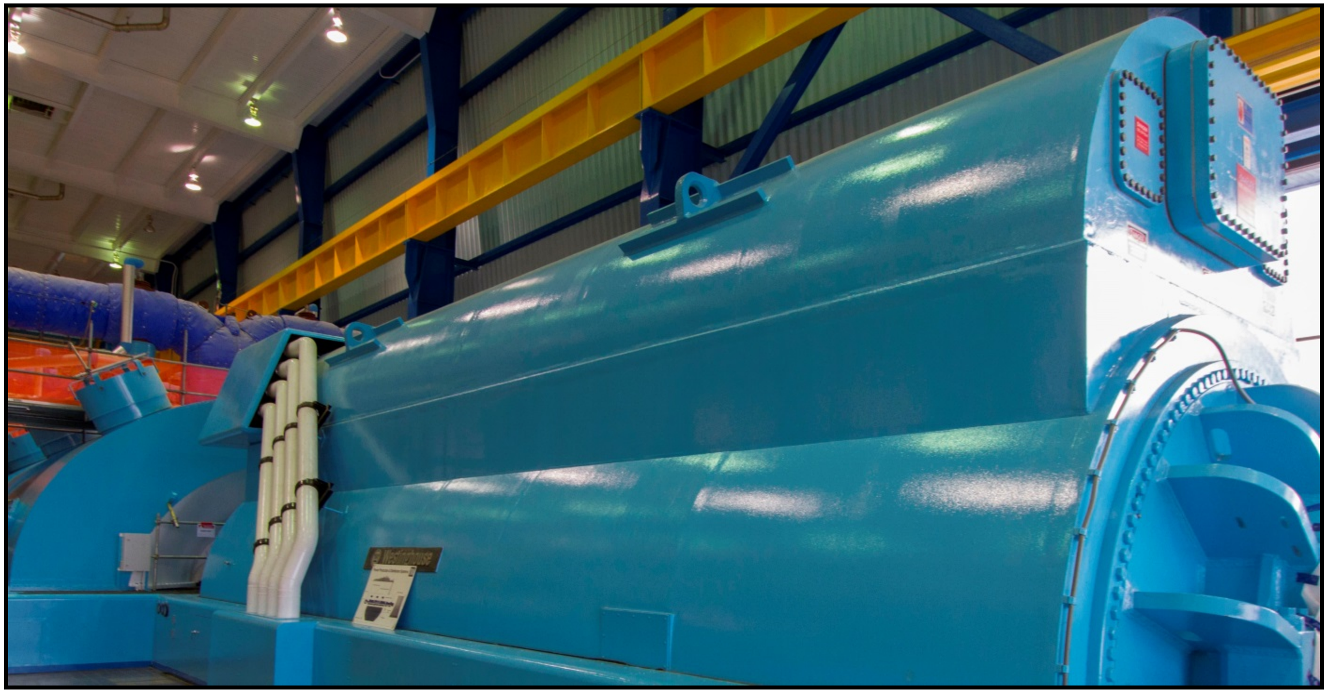
Watts Bar Nuclear Plant
ACRS Full Committee
February 5, 2015

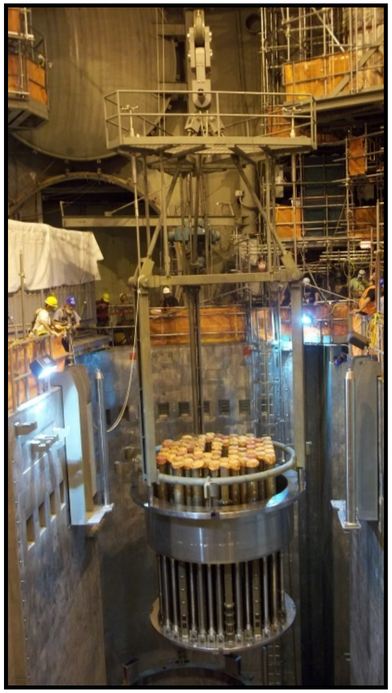
Agenda

- Overview of Watts Bar Unit 2 Project
- ACRS Requested Topics
  - Eagle 21 Two Way Communication Testing
  - Thermal Conductivity Degradation
  - General Design Criterion - 5
  - Containment Recirculation Sump
  - Hydrology
  - Fire Protection Report/Operator Manual Action (OMA) Feasibility

Watts Bar Unit 2 Guiding Principles

- Safe and high quality
- Design basis fidelity with Watts Bar Unit 1
- Systems, structures, and components rebuilt, refurbished, or replaced

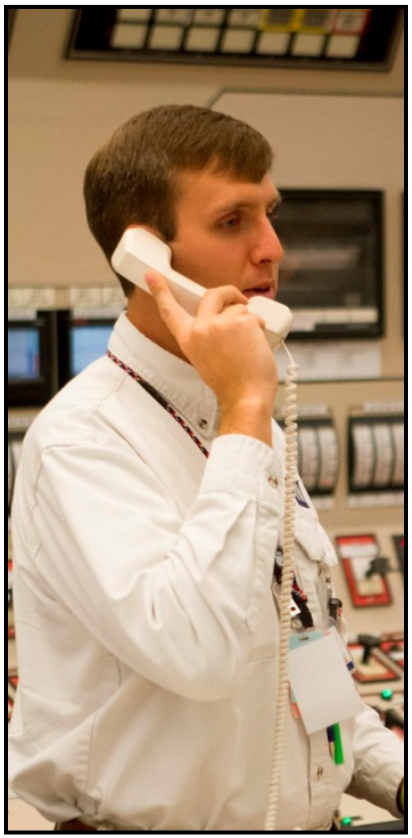




Watts Bar Unit 2 Milestone Status

- Completed primary cold hydrostatic test
- Completed secondary steam generator hydrostatic test
- Completed secondary hydrostatic test
- Start ice load – Forecasted February 2015
- Start hot functional testing (HFT) – Forecasted March 2015
- Fuel load – Forecasted June 2015

Watts Bar Readiness for Dual Unit Operation



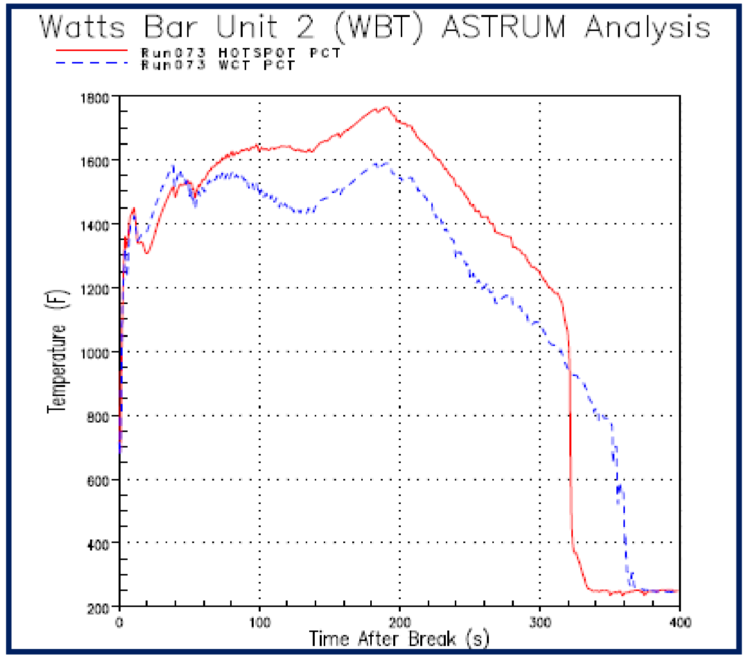
- Transition and operational readiness overview
  - Operating organization driving transition
  - Unit 1 sharing ownership of critical Unit 2 milestones
  - Staffing at appropriate level
  - Training complete for dual-unit operation
  - Corporate organization providing oversight and support
  - Preparing for Operational Readiness Assessment Team Inspection

Eagle 21 Two Way Communication Testing

- Eagle 21 is a Firmware based digital system that has an external communications interface for transfer of plant data parameters to the Unit 2 plant Integrated Computer System (ICS).
- Each Eagle Rack is divided into a
  - Loop Calculation Processor (LCP) Subsystem which performs safety related functions
  - Test Sequence Processor (TSP) Subsystem which performs non-safety related functions including communications to the ICS
- The communications interface from the LCP to the TSP is ensured to be unidirectional
  - LCP data link handler (DLH) has no receive integrated circuit (IC)
  - TSP DLH has no transmit IC
  - Serial-ethernet converter (SEC) has no transmit IC

Thermal Conductivity Degradation (TCD)

- Watts Bar Unit 2 large break (LB) loss of coolant accident (LOCA) based on Westinghouse codes ASTRUM (LOCA) and PAD 4 (Fuel Rod Performance) Peak Clad Temperature (PCT) 1552°F
- Nuclear Regulatory Commission (NRC) issued Information Notice 2009-23 and 2011-21 on TCD/Realistic LOCA Models
  - Vendor safety analyses potentially non-conservative due to TCD, specifically mentions ASTRUM/PAD
- Pressurized Water Reactor (PWR) Owners Group Project to estimate TCD impact based on plant groupings – PCT 1727°F
- Watts Bar Unit 2 requested Westinghouse to perform specific Unit 2 reanalysis for licensing
  - Uses ASTRUM and PAD4+TCD, PCT 1766°F



- Margin remains to 2200°F
- NRC audited and approved results for first operating cycle
- License condition for Unit 2 Cycle 2
  - Re-analyze LBLOCA once PAD 5 topical approved by NRC

General Design Criterion (GDC) 5

- Watts Bar designed as a hot standby plant
  - One unit in accident and can be cooled safely
  - Second unit can remain safely in hot standby (≥350ºF)
  - Non-accident unit can be brought to cold shutdown in 72 hours for GDC 5 compliance
  - Limitation is non-accident unit remains in hot standby (safe shutdown state) for 48 hours prior to entering residual heat removal (RHR) cooling
  - Auxiliary feedwater to steam generators (SGs) and steaming from SG power operated relief valve (PORV) or safeties
  - If non-accident unit is already on RHR in less than 48 hours, it may be necessary to return unit to hot standby
  - Allows decay heat to subside prior to adding load to Component Cooling System (CCS)
  - NRC approved approach in Supplemental Safety Evaluation Report (SSER) 27
- Remaining action
  - Technical specification revision submitted

Containment Recirculation Sump

- Strainer design similar to Unit 1
- Unit 2 containment low fiber design
- Analyses include
  - Debris generation and transport
  - Strainer head loss
  - Chemical effects using Westinghouse methodology
  - Downstream effects using Westinghouse methods
  - Orifice erosion evaluated
  - Impacts on pumps, valves, and fuel evaluated
  - LOCA deposition model (DM) used to predict impact on fuel temperature
- Final Implementation
  - Final accounting of coating mass
  - Final walkdown for latent debris and cleanliness
  - Installation of strainer modules

Tapes, Tags, Labels History

- Original sump screen designed for an additional 1000 ft^2 unqualified tapes, tags, and labels (TTL)
- 3D computational model conservatively predicted transport of TTL
- NRC issued guidelines for testing
- Special test for reflective metallic insulation (RMI) and TTL demonstrated insignificant transport occurs
- Final sump tests excluded RMI and TTL stimulant materials
- Conservatively included blocked 200 ft^2 sacrificial area for miscellaneous debris
- Methodology approved in SSER 27

Watts Bar Hydrology Status

- Performed a probable maximum flood (PMF) analysis of the Tennessee River and tributaries using the industry standard hydraulic modeling tool Hydrologic Engineering Centers River Analysis System (HEC-RAS)
- Dams credited in the PMF simulations confirmed stable using current standards or modified
- Dam modifications completed or completed by fuel load
- Systems, structures, and components required for flood mode operation at Watts Bar site protected or designed for submergence
- Unit 1 license amendment approved January 28, 2015

Upgraded Hydrology Scenario for WBN

- Two significant changes in approach
  - Converted hydraulic modeling to HEC-RAS – Recognized industry standard
  - Adopted current River Operations (RO) Dam Stability Guidelines – TVA's Dam safety authority
- HEC-RAS model completed and used to determine new PMF levels
- Dam stability analysis to new PMF using RO guidelines
- Reliance on those dams proven to be stable or those modified to be stable
  - Substantive modifications to five dams
- Postulated failure for four additional dams in the system
  - Assumed conservative conditions

Dam Modifications Status

Dam	Modification
Cherokee	Post-tensioning non-overflow dam and raising embankment overtopping elevation (removing HESCO barriers)
Douglas	Post-tensioning non-overflow dam and raising embankment saddle dam overtopping elevation; adding saddle dam toe berms
Fort Loudoun	Post-tensioning non-overflow dam (remaining HESCO barriers will be removed following installation of new bridge)
Tellico	Reinforcing the non-overflow dam “neck” and raising the embankments overtopping elevation (removing HESCO barriers)
Watts Bar	Reinforcing the portions of the non-overflow and lock “necks”; raising the overtopping elevation of embankments and flood walls (removing HESCO barriers); lowering the west saddle dam elevation to 752.0 feet

Summary

- Results
  - Design Basis Elevation – 739.2
- Advantages to Approved Approach
  - Aligned with current industry guidelines
  - Conservative assumptions
  - Provides basis for Unit 2 licensing
  - Provides well documented basis and results
  - Supports the Fukushima analysis
  - Supports TVA Dam Safety Program

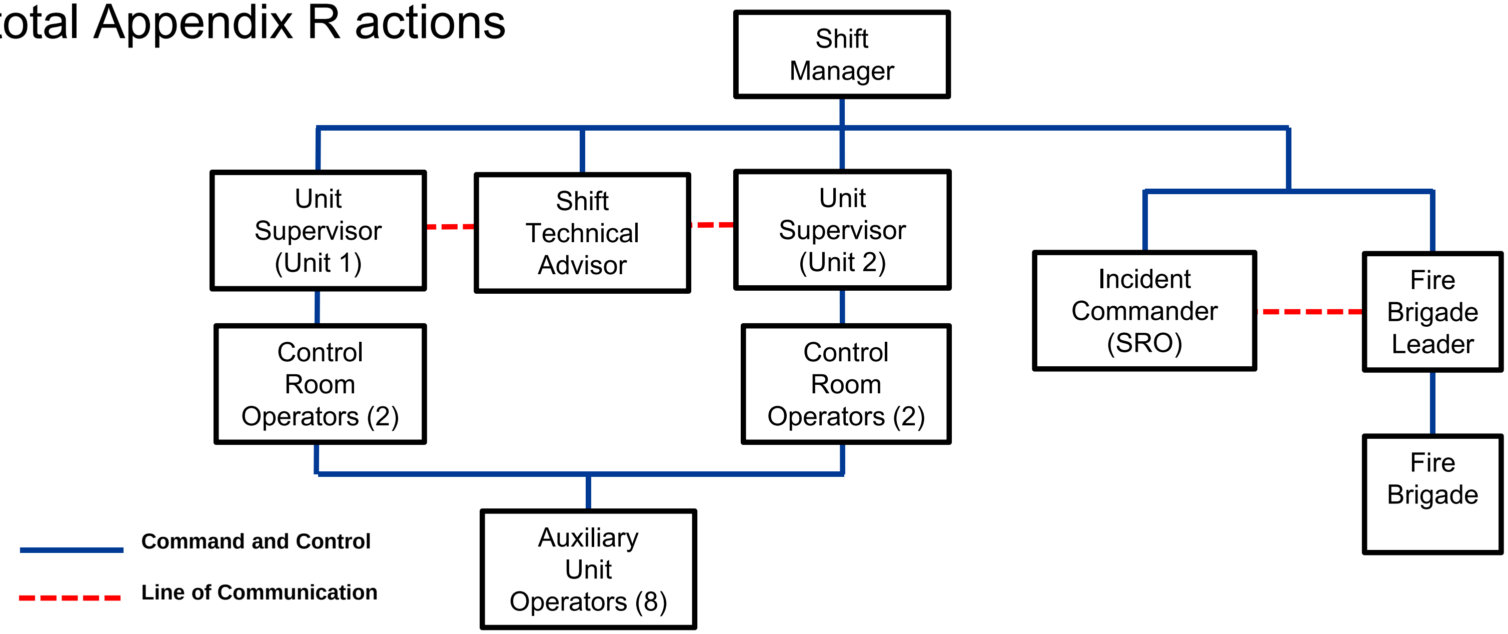
Fire Protection Feasibility and Reliability of Operator Manual Actions

- Operator manual actions (OMAs) taken in response to a fire are evaluated according to the guidance in Regulatory Guide 1.189, Revision 2, "Fire Protection for Nuclear Power Plants," and NUREG-1852, "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire."
- Our timelines and methods considered the following:
  - Fire detection
  - Condition diagnosis
  - Personnel assembly
  - Communications
  - Coordination
  - Supervisor direction
  - Implementation of required actions
  - Transit
  - Assessment of the uncertainties and available time margins

Fire Protection Feasibility and Reliability of OMAs

Staffing and Training

- Main Control Room (MCR) and Auxiliary Unit Operator (AUO) staffing based on total Appendix R actions



- Staff trained on Appendix R procedures and expectations
- Dedicated Fire Brigade

Fire Protection Feasibility and Reliability of OMAs

Fire Detection

- Cross zone detection (most areas of the plant)
  - No delay for confirmation of fire
- Single zone detection with visual confirmation
  - Delay times accounted for in feasibility evaluations
- Fire reported by plant personnel (personnel continuously in buildings)
  - No delay for confirmation of fire
- High pressure fire protection system initiation
  - No delay for confirmation of fire
- CO_2 system initiation
  - No delay for confirmation of fire

Fire Protection Feasibility and Reliability of OMAs

Scenarios

- Slow, undetected fire

  Examples of engineering and administration controls in place

  - Controlled Combustible Loading Program (permanent and transient)
  - Hot work permit and fire watch procedure
  - National Fire Protection Association code compliant detection and suppression
  - Equipment separation (Regulatory Guide 1.75 and Appendix R)

- Rapid fire

  No condition which would result in immediate need to declare Appendix R event

  - Occurs only with accelerant present (e.g., oil filled transformers)
  - Five locations
  - First required OMA in 1 hour

Fire Protection Feasibility and Reliability of OMAs

Condition Diagnosis/Personnel Assembly

- MCR diagnoses initial plant response under Abnormal Operating Instruction (AOI) 0-AOI-30.1, “Plant Fires”
  - Dispatch Fire Brigade
  - Initiate personnel assembly
  - Verify high pressure fire pumps running
  - Evaluate fire criteria for entry into 0-AOI-30.2, “Fire Safe Shutdown”
- AUO personnel availability demonstrated
  - First AUO available in 3 minutes
  - Second AUO available in 5 minutes
  - Other AUOs available within 8 minutes
- AUOs dispatched immediately upon declaring Appendix R fire

Fire Protection Feasibility and Reliability of OMAs

OMA Performance Times

- Appendix R time requirements start when reactor tripped
  - First AUO available performs OMAs with shortest allowed time
  - OMA allowed times include transit time from MCR/Auxiliary Control Room and performance time
- OMAs proceduralized and thus do not require diagnostic time
- OMA performance times demonstrated by walkdown
- Feasibility and reliability evaluations accounted for environmental conditions

Fire Protection Feasibility and Reliability of OMAs

Environmental Considerations

- Lighting on transit paths and OMA performance locations
- Smoke
  - No short-term OMAs in fire area
  - Large rooms provide smoke buffer
  - Specific fire plans for OMAs potentially affected by smoke
- Radiation
  - No OMAs in high radiation areas
  - No short-term OMAs require C-zone dress-out
- No impact from noise since OMA actions proceduralized and AUOs familiar with plant locations
- Sprinklers, temperature, humidity, and proper personal protective equipment accounted for
- Environmental conditions accounted for with a factor of 2 margin

Fire Protection Feasibility and Reliability of OMAs

Communications

- Two physically separated radio systems
- Verified radios available to support required OMA communications
- AUOs carry radios

Dual-Unit Demonstration

- Fire affects both units
- Demonstrated effective coordination between MCR and AUOs
- Performance times met NUREG-1852 margin criteria

Fire Protection Summary

- Robust detection, administrative controls, and equipment separation aid to preclude fire development
- Strong command and control
- Rapid response to the fire condition
- Staff proficient and qualified
- OMAs in accordance with NUREG-1852
- Feasibility and reliability evaluations include NUREG-1852 environmental conditions
- Appendix R response ensures safe shutdown is achieved and maintained
- Watts Bar Fire Protection Program will support dual-unit operation

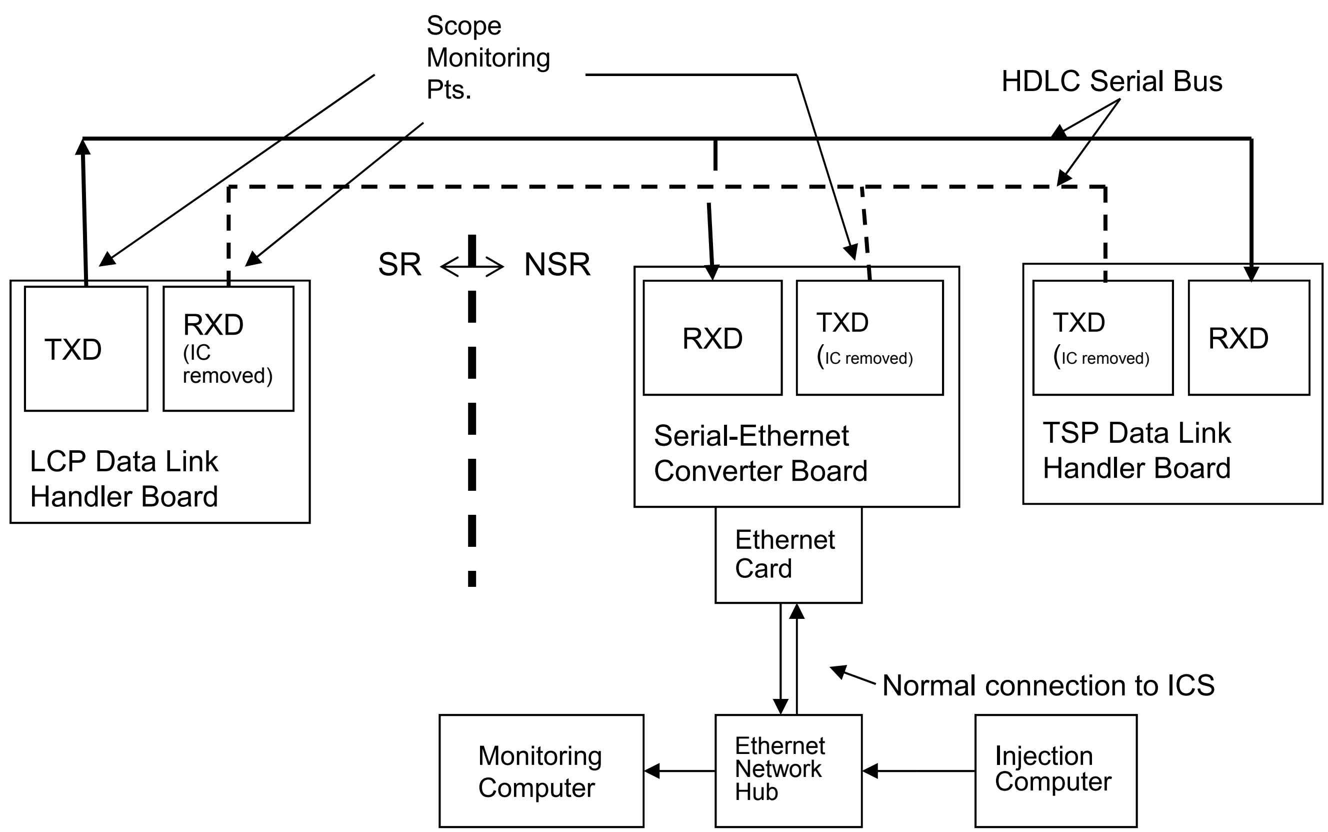
Closing Remarks

- TVA is prepared to successfully operate and maintain two units at Watts Bar Nuclear Plant.
- Watts Bar Unit 2 is being completed the right way – safely, with quality, and in a manner to protect the operating unit and assure excellence in operations following licensing.
- With the completion of Watts Bar Unit 2, the station will have two units with a consistent licensing and design bases and minimal, known differences that are addressed through training.
- Watts Bar Unit 2 is being built on proven technology, established standards, extensive operating and construction experience, and technological and engineering advances brought about by industry and regulatory demand for ever improving safety.

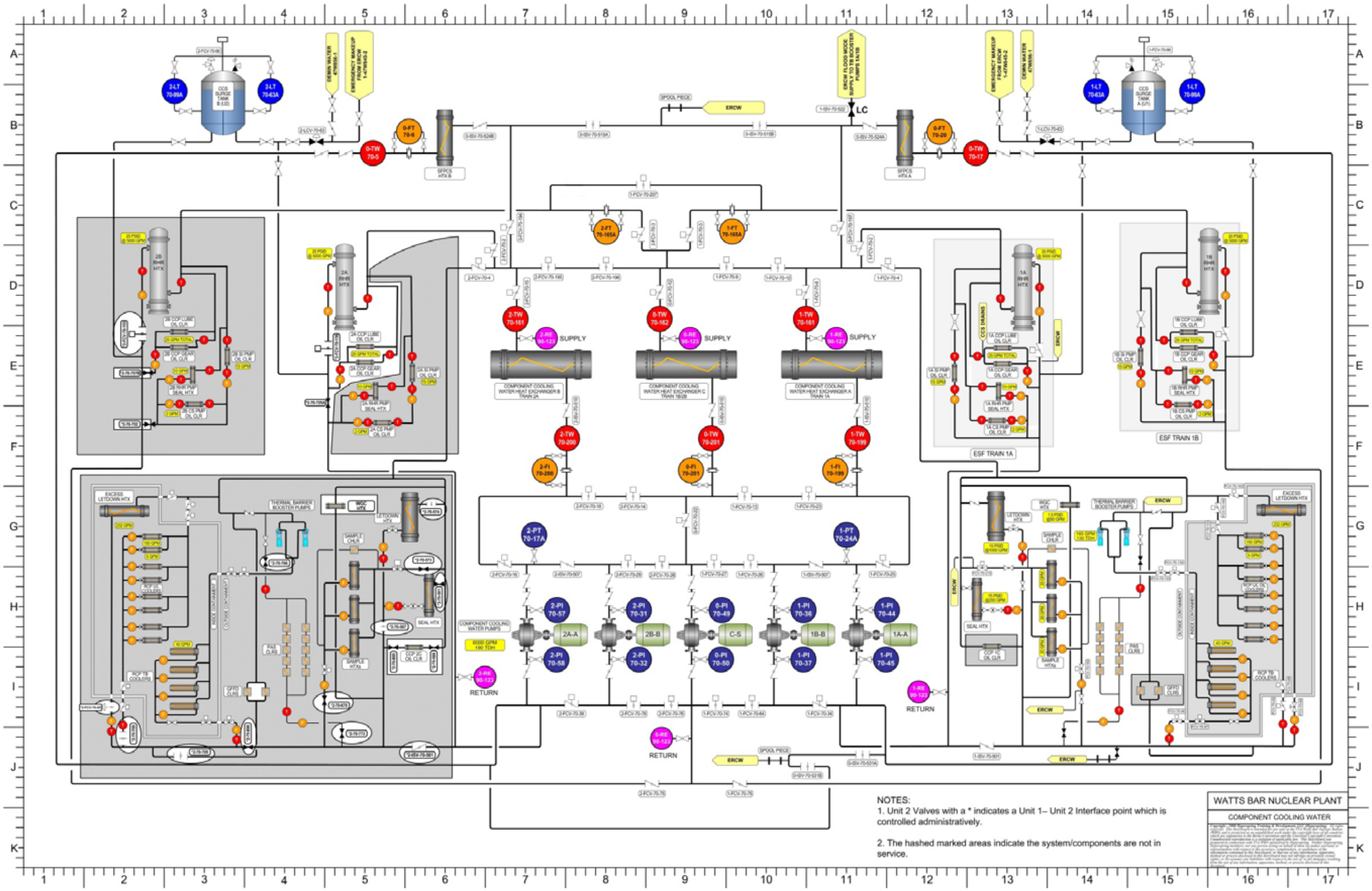
Questions

Background Information

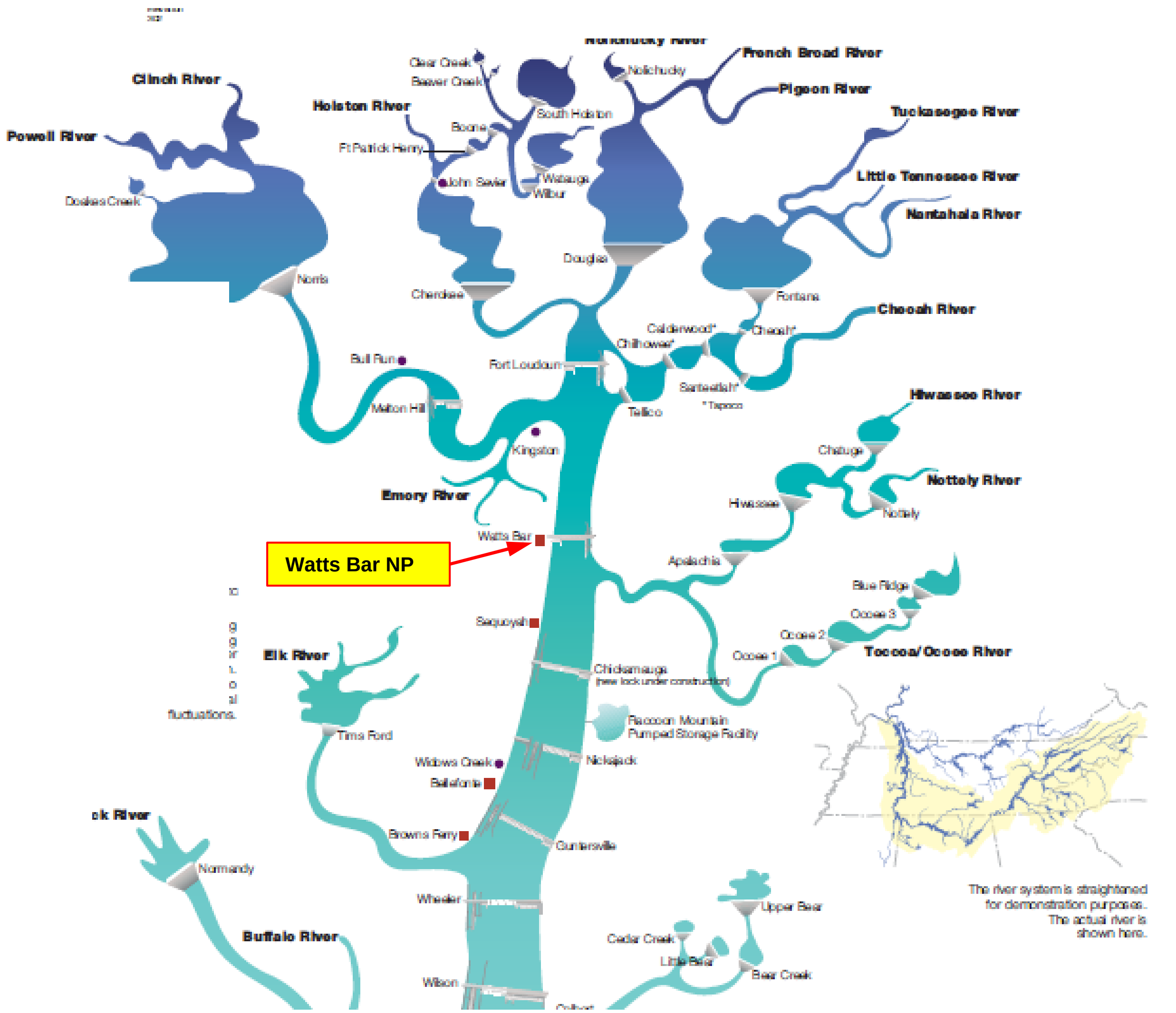
Eagle 21 Two Way Communication Testing



General Design Criterion 5

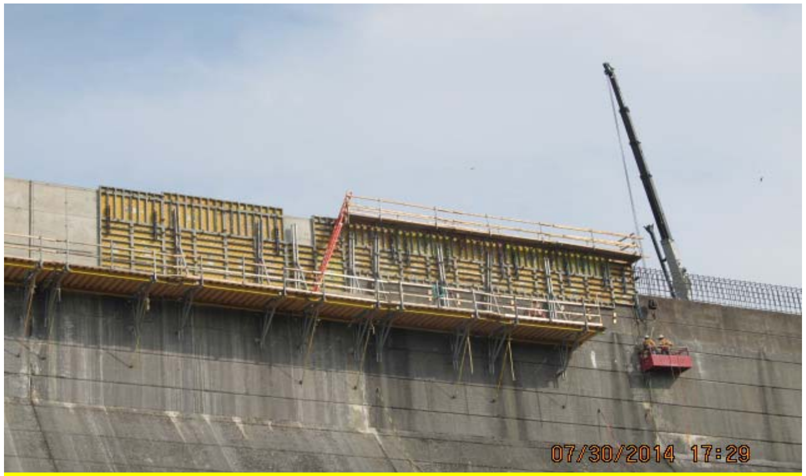


Tennessee River and Tributary Dams



Watts Bar Site on Tennessee River

Cherokee – Non-overflow Dam



Installing Dowels for Platform

Placement of Flow Fill in Seepage Cutoff for RCC

Drilling on TW-965-12 Anchor Hole

Drill on 28-1 Spillway Anchor Holes

Watts Bar – East Embankment Extension

Embankment at Final Grade – August 26, 2014

Preliminary Indications from Near Term Task Force 2.1 Flooding Hazard Reevaluation For Recommendation

- Flooding Hazard Reevaluation For Recommendation (FHRR) 2.1 results are Beyond Design Basis
- We expect an Integrated Assessment to be required
- Fukushima Probable Maximum Flood (PMF) is likely our controlling case – not seismic or sunny day failure
- The work on Cherokee (CRH) and Douglas (DGH) dams provide protection in the 2.1 PMF scenario
- DGH Saddle Dams 1 And 3 may need to be raised to fully credit those structures
- Differences between Licensing Basis and FHRR
  - National Inventory of Dams Inflows
  - Combined effects – wind-wave on reservoirs
  - Seismic – Dam Stability

ACRS Full Committee Meeting Regarding NRC Review of Operating License Application for Watts Bar Nuclear Plant Unit 2

Docket No. 50-391

February 5, 2015

Office of Nuclear Reactor Regulation (NRR) –
Michele Evans and Justin Poole

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Agenda Topics

- **TVA**
  - Overview of Project Status
  - Items identified in ACRS Interim Letter
- **NRC**
  - Summary of previous ACRS meeting
  - Closure of items from ACRS Interim Letter
  - Inspection Status
  - Future Milestones

NRC Review of the Operating License Application for Watts Bar Nuclear Plant Unit 2

NRR – Justin Poole

U.S.NRC
United States Nuclear Regulatory Commission
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Previous Full Committee Meeting

- Topics Discussed
  - Project background
  - How the scope of the review was defined
  - Staff review to date
  - Remaining activities
  - Inspection status
- Interim letter described 8 open items for the staff to present to ACRS
  - Discussed with the Subcommittee on January 13, 2015

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Closure of Interim Letter Items

- Hydrology (Open Items 133 and 134)
  - Open Item 133: Stability of sand baskets
    - Not required during seismic event
    - Most permanent modifications in place prior to issuing OL
    - Staff closed Open Item 133
  - Open Item 134: Hydrology Review
    - Approved change to Unit 1 licensing basis
      - Use of HEC-RAS, FERC dam stability criteria
    - Proposed licensing basis for Unit 2 is the same as Unit 1
    - Staff will document the closure of Open Item 134 in next SSER

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Closure of Interim Letter Items (cont)

- Fire Protection Operator Manual Actions
  - Uncertainties are addressed through time margin
    - OMAs have >100% margin or
    - NRC staff reviewed
- Eagle 21 Communications (Open Items 63 and 93)
  - Staff reviewed test plan, set-up and summary of test steps, and results and RII witnessed during inspection
  - Staff found setup to be appropriate and results showed two-way communication can not occur.
  - Staff closed Open Items 63 and 93

Closure of Interim Letter Items (cont)

- Use of PAD4TCD (Open Item 61)
  - Staff performed confirmatory analysis which showed good agreement between PAD4TCD and FRAPCON.
  - Staff closed Open Item 61 and included a proposed license condition limiting use to the initial fuel cycle.
- Emergency Raw Cooling Water (Open Item 91)
  - Staff is satisfied the wording in the FSAR ensures that the ability to bring the non-accident unit to cold shut down is now included in the system requirements.
  - Staff closed Open Item 91

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Closure of Interim Letter Items (cont)

- Coatings (Open Item 59)
  - Assumptions made in response to GL 2004-02 match the statements added to the FSAR.
  - Staff closed Open Item 59

Region II Presentation of Construction Inspection Activities

RII – Robert Haag

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Construction Inspection Program

- Continuing with inspections specified in IMC 2512 and 2513 - construction, pre-operational testing and operational preparedness
- Utilizing IMC 2517; customized guidance to address the unique history of Watts Bar Unit 2
- Historical inspection results and the delay in construction factored into inspection effort
- 553 construction inspection items identified (IP&S database)

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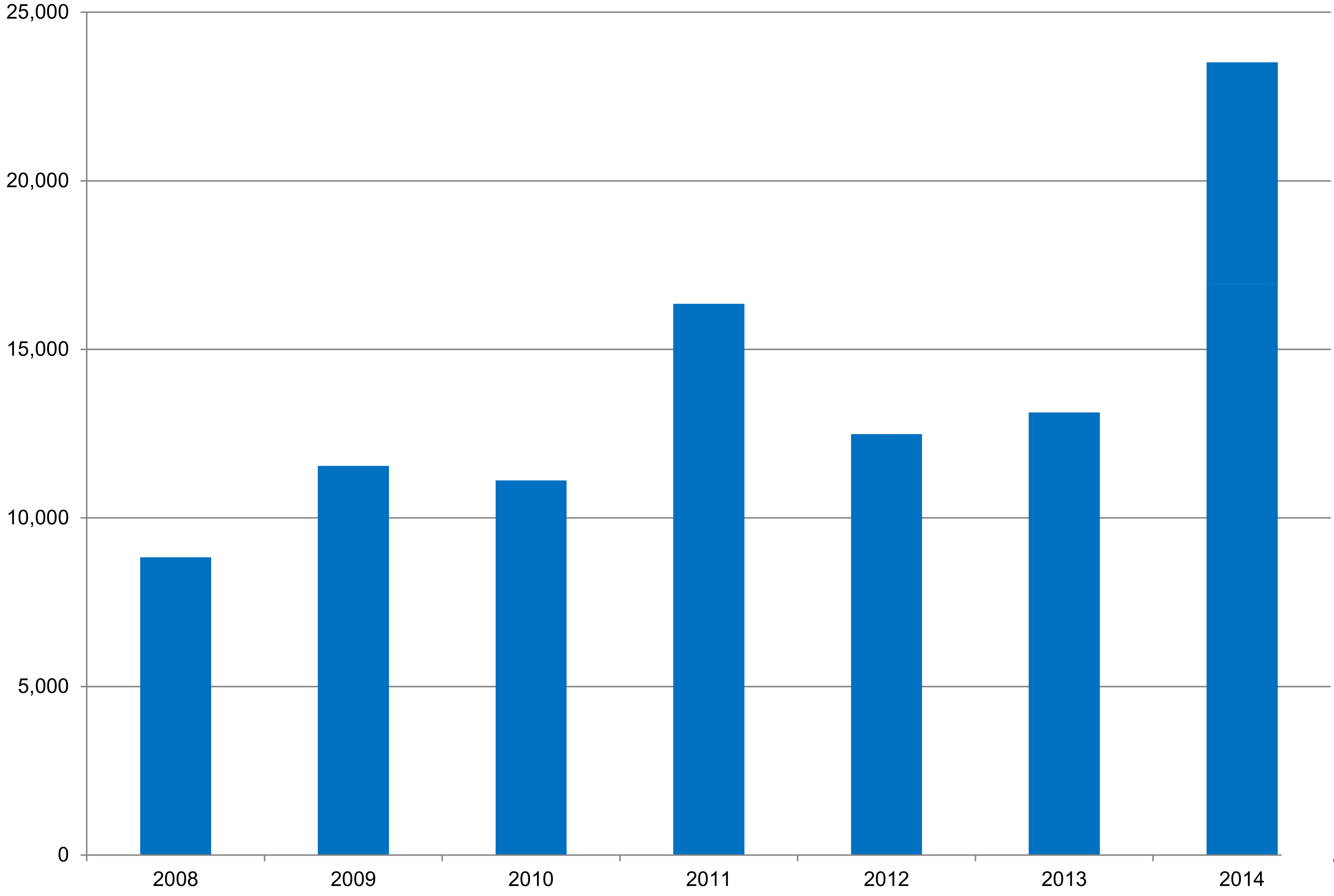
Status of Construction Inspection Activities

- Significant inspection effort in 2014
- 94 IP&S items remain open
- Large majority of remaining IP&S items have been inspected
- Pre-operational testing inspections closely following TVA's testing activities

Substantial Inspection Effort Expended on Watts Bar Unit 2



Operational Preparedness Inspections

- Scope of operational preparedness inspections adjusted based on existing site wide programs and processes being utilized
- Completed 21 of 36 inspection procedures in Appendix B of IMC 2513
- Fire protection inspection identified problems requiring corrective actions

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Remaining Inspection Activities

- Construction items (IP&S)
- Pre-operational testing and operational preparedness
- Operational Readiness Assessment Team (ORAT)
- Follow-up to Fukushima Orders (TI-191)
- Fire Protection
- Cyber-security

Inspection Activities – Path Forward

- Inspection activities on-track to support licensing decision
- Sufficient inspection resources available
- No substantial concerns or issued identified at this time
- ROP transition plan developed; final reviews and issuance remaining

Watts Bar Unit 2 Remaining Activities

NRR – Justin Poole

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Overall Project Completion

- Future Milestones
  - Closeout of remaining Open Items
  - Commission Vote Paper
  - Operational readiness assessment
  - Certification of as-built construction

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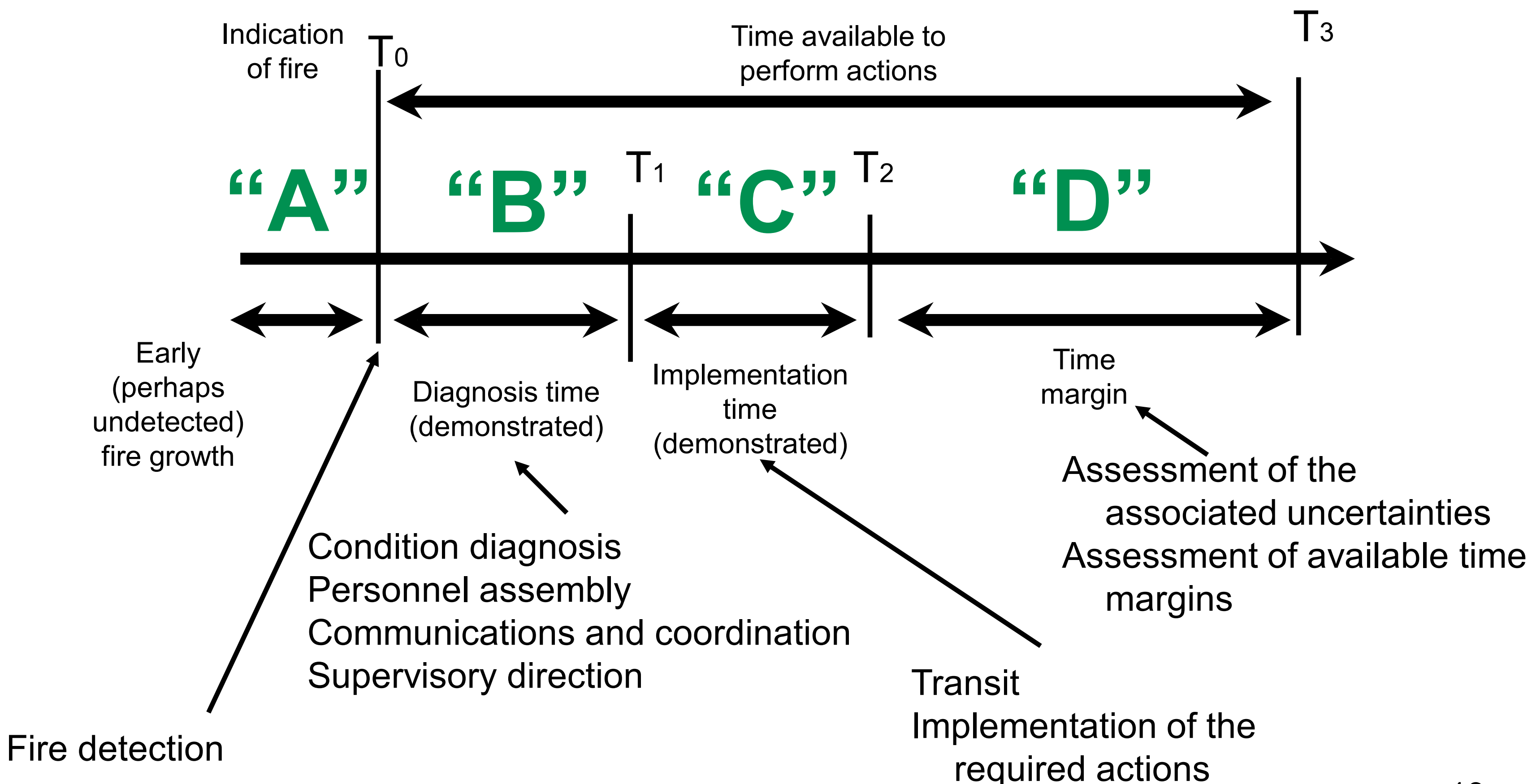
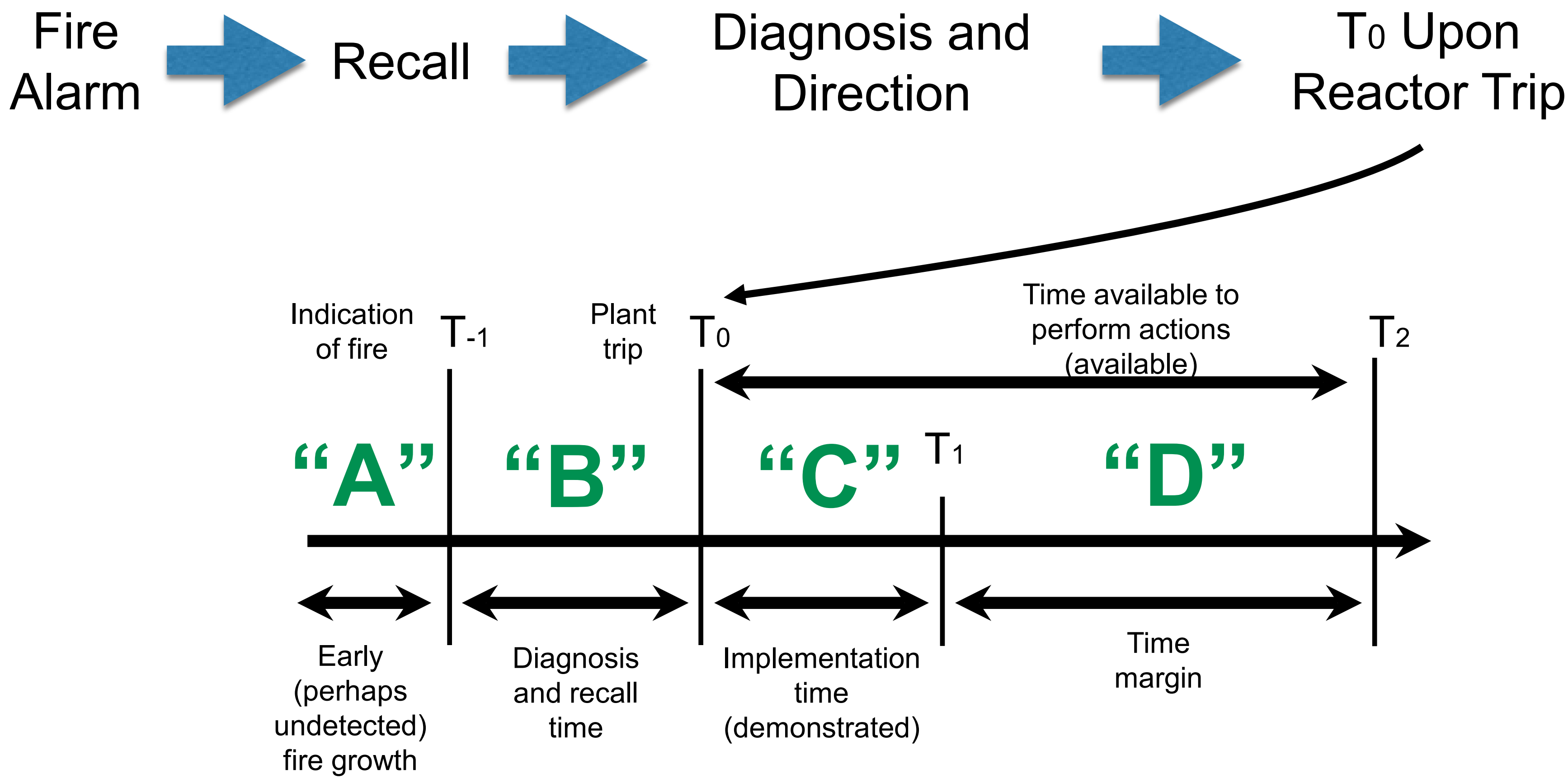
Backup Slides

The figure compares ACRS' topics for additional explanation to the NUREG-1852 timeline.

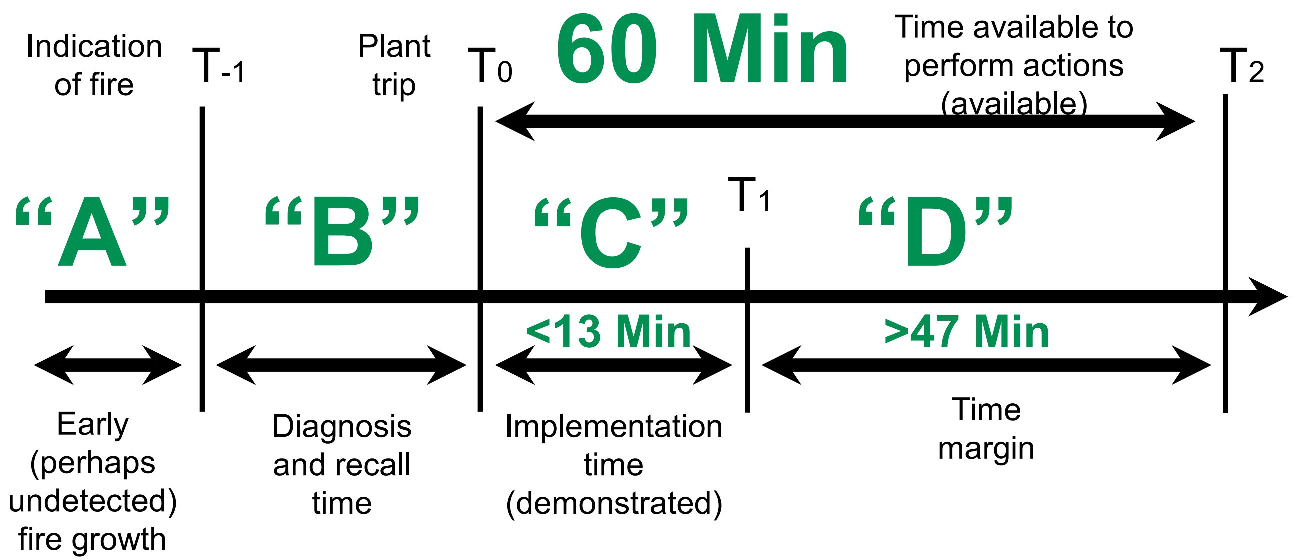


Watts Bar 2's analysis modifies the entry point into the NUREG-1852, to simplify Time=0.



Uncertainties are addressed through time margin. OMAs have >100% margin or the NRC staff has reviewed.

Operator Manual Action (OMA)1016
in Room 757.0-A10



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Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (NUREG-0800) *Revision 7 to Section 13.1.2-13.1.3* *"Operating Organization"*

Staff: Rick Pelton, Jonathan DeGange

Office of New Reactors

Presented to ACRS

February 5, 2015

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SRP Ch. 13 Update

- Staff issued several ***draft*** revisions to SRP sections in Ch. 13 on 9/14/2014 for public comment on the Federal Register (79 FR 57141) :
  – 13.1.1, *Management and Technical Support Organization*
  – 13.1.2-13.1.3, *Operating Organization*
  – 13.2.1, *Reactor Operator Requal. Program, Training*
  – 13.2.2, *Non-Licensed Plant Staff Training*
- SRP sections updated to :
  – Incorporate lessons learned from recent LWR reviews
  – Provide clarifications to guidance that historically resulted in RAIs during application reviews
  – Incorporate Interim Staff Guidance (ISG)
  – Incorporate the concepts of risk-informed decision making

SRP Ch. 13 Update
Lessons Learned, Clarifications

- Lessons learned and clarifications
  - Provided greater specificity in Areas of Review for applications
  - Updated references to 10 CFR Part 55
  - Provided references appropriate RGs for means of achieving compliance
  - Added more guidance on license transfers

SRP Ch. 13 Update Incorporation of ISGs (1/2)

- Incorporates Interim Staff Guidance (ISGs)
  - Incorporates elements of DC/COL-ISG-011 for finalizing design information and tracking changes
    - Applicants should provide a description of means to ensure document control, retention, search and retrievability.
    - Applicants will need to rely on their programs to evaluate, track, and report (as appropriate) changes identified after the licensing-basis freeze point.

SRP Ch. 13 Update Incorporation of ISGs (2/2)

- Incorporates elements of DC/COL-ISG-015 for tracking post-COL commitments.
  - *The applicant should provide information regarding the organizational unit and any augmenting organizations, or other personnel, who will manage or execute the resolution to NRC satisfaction of COL items that cannot be resolved prior to issuance of a COL as defined in DC/COL-ISG-015.*

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SRP 13.1.2-13.1.3 Update
Use of risk information (1/2)

- **Overall approach**: Be cognizant of risks when making decisions about changes to licensing basis and plant operations
- **Staff position** : Plant staff should have an awareness of risk-informed decision making
- **SRP Revision**: Added references to risk-related RGs (e.g. 1.174, 1.175, etc.) for applicants and NRC reviewers to have an awareness of risk-informed decision making approaches endorsed by the NRC

SRP 13.1.2-13.1.3 Update
Use of risk information (2/2)

- RG 1.174, 1.175, 1.177, and 1.178 are *voluntary* for risk-informed applications
- Reference to these RGs was included to ensure that plant staff have an **awareness** of risk-informed decision making
- Staff will make clarifications to guidance upon issuing final SRP revisions