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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

October 22, 2008

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

SUBCOMMITTEE ON THE ESBWR COL APPLICATION

MEETING

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WEDNESDAY, OCTOBER 22, 2008

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The meeting came to order at 8:30 a.m. in Two White Flint North, Room T2B3, 11545 Rockville Pike, Michael Corradini, chairman, presiding.

PRESENT:

MICHAEL CORRADINI	CHAIRMAN
CHARLES H. BROWN	MEMBER
JOHN W. STETKAR	MEMBER
WILLIAM J. SHACK	MEMBER
J. SAM ARMIJO	MEMBER
DENNIS C. BLEY	MEMBER
JOHN D. SIEBER	MEMBER
GRAHAM WALLIS	CONSULTANT
THOMAS S. KRESS	CONSULTANT

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

8:30 a.m.

CHAIRMAN CORRADINI: Okay. Let's get started.

Our court reporter seemed to have gotten waylaid, so we are taping the session from the overhead mikes and the mikes on the table.

So let me start off we're going to essentially start off with sections 14.3 and Rick Wachowiak from GEH will start the conversation with us, the discussion with us. But let me remind everybody to identify yourself and speak with sufficient clarity and volume since our backup system works, but is not as precise as our main system.

Rick?

MR. WACHOWIAK: All right. Get started.

I'm Rick Wachowiak from GE Hitachi. This morning we're going to talk about Section 14.3 and Tier 1 of the DCD for ESBWR.

Patricia Campbell is on the Tier 1 team with us. She's up here for support and also to cover the DAC closure process that we have. And Steve Kimura is also the I&C member of our Tier 1 team.

CHAIRMAN CORRADINI: The one thing, I guess I said it but I'll reenforce, given the fact that we're all just being taped, I'd ask the members and the consultants to identify themselves before they make their questions or comments.

Go ahead.

MR. WACHOWIAK: So let's jump right into it. We're going to talk about, as I said, the Tier 2 Section 14.3, which is basically our instructions for how we plan on writing Tier 1. And then Tier 1 itself. And we're going to cover both of these in tandem so we're not going to go through all the 14.3 and then go back and do Tier 1. So we'll try to keep those sections altogether.

Basically the important part here is the ITAAC for Tier 1. We talked about that yesterday afternoon: What its supposed to do, what it is, why its there. And we'll talk a little about that today.

In the ESBWR application we have an Appendix to 14.3 which is our interpretation of how a DAC closure process would work. And we'll talk about that toward the end of the presentation. A couple of COL information items and then we'll wrap it up.

Go to the next slide.

So 14.3, I think I said this already, it provides the overview of how the Tier 1 information is put together. And then Tier 1 is basically required by Part 52 to be, the way I like to call it, the legal description of the plan. Some have thought of it before as an executive summary, but it's really more of a legal description. It says what is the plant and its done in very concise terms.

And the other thing that we noticed when we were putting our schedule together for how we would manage closure of the ITAAC, I was trying to explain. Somebody asked yesterday did anybody explain this to members of the public. And we had to explain it to the people on the construction team what is an ITAAC and what is it that we're going to do with these. And I said think of the ITAAC as ESBWR specific regulations. Because that's what really the ITAAC are; it's a list of about a thousand specific things that the ESBWR has to meet.

CHAIRMAN CORRADINI: I thought you were going to say to construction people it's a punch list. That's what they understand. They've got their punch list. And until all the things are

done, they can't turn over the building.

MR. WACHOWIAK: And that's right. And that's the way they're thinking of it as the punch list. But we have to add the extra piece. It's the punch list with extra punch. Because there no deviations from the punch list.

So let's go on with the rule.

DR. WALLIS: I'm Graham Wallis.

I'm asking you why are you presenting GE's slides?

CHAIRMAN CORRADINI: Because he's GE.

DR. WALLIS: All right. I was confused. I thought he was starting off with the staff. That's all right.

CHAIRMAN CORRADINI: This is the GE Hitachi presentation.

DR. WALLIS: Okay. Thank you very much.

CHAIRMAN CORRADINI: The staff will be up here later.

DR. WALLIS: That clarifies everything. Very good.

MR. WACHOWIAK: However, if you want to give me that sign that --

DR. WALLIS: That's all right.

MR. WACHOWIAK: So we talked about this

yesterday. But the ITAAC for a facility, this is different than the DCD. The facility is the plant and its basically everything addressed by the COL. But there's ITAAC more than just what's in the DCD.

We have the design certification ITAAC in Tier 1. Mainly what we're going to talk about here is physical security ITAAC, that would be supplied by the applicant, the COL applicant later. Emergency planning ITAAC through the physical security hardware. We're still trying to figure out where that goes. It's been in the DCD and out of the DCD, and I think currently it's in or at least parts of it are in.

Emergency planning ITAAC, which is going to be supplied by the applicant. And then other site-specific ITAAC.

So when we're talking about ITAAC, it's really the whole population. But for the certification application we're really talking about that first bullet there, which is the ITAAC associated with things that are in the design certification document.

MEMBER ARMIJO: The physical security, is it going to be in the DCD and the COL or is that -- where is going to wind up?

MR. WACHOWIAK: That's one of the things that we're trying to work out. Right now we have the pieces of the physical security, the hardware for physical security that's in the certified design. And if through the industry workshops that are still going on in this area it's determined that we need to add something else to physical security, it's likely that that's going to end up being in that in the COL.

MS. CUBBAGE: This is Amy Cubbage with the staff.

This is an ongoing issue right now with industry. Just to the issue is that you cannot have ITAAC in the DCD for futures that are not in the DCD. So you need to divide the scope of what's being handled in generic manner in certification and then have ITAAC as appropriate for those features. And any site-specific security features would have to be addressed by the COL applicant in their ITAAC.

MEMBER ARMIJO: Okay. So it'll wind that physical security will be in both DCD and COL?

MS. CUBBAGE: Could be in both.

MEMBER ARMIJO: And that's okay --

MS. CUBBAGE: And that's okay. Right. The generic ITAAC will have to be adopted by all COL

applicants and then supplement with their site-specific ITAAC which will cover some aspects of the physical security.

MEMBER ARMIJO: Thank you.

MR. WACHOWIAK: Back to Rick Wachowiak from GEH.

In the end when we're closing ITAAC whether it came from the DCD or whether it came from the COL, it really doesn't matter. I think they're all going to be handled the same way on the closure side.

So back to our document. We've got Section 14.3, just like any other section in the DCD, its broken up into multiple sections and what those are covered.

14.3.1 describes the introduction material in Tier 1. And in Tier 1 Section 1 is where we have that information. It's basically a definition of terms. It talks about the general provisions of the ESBWR, which it's just a short description of what the plant is. And then we have a legend in there for the figures that are contained in Tier 1.

The Tier 1 document, as we said yesterday, is going to end up being published as

part of an Appendix to Part 52. We want to make sure that it's enough stand alone there so that when someone picks up and looks at the figures that are in there, that the legend in the first part covers what would be seen there. You wouldn't have to go to a different document.

Go to the next one.

Okay. Now we're going to get into the meat of Tier 1. And we talk about in Section 2, which are the system-based information. And what we've done is we've gone through the plant system-by-system and put in a few things.

One is the design description is required to be in Tier 1. And that's the up front material. In the middle we'll talk about what is the design description material.

And then the design description is followed by the table of the ITAAC, which are the design commitments, which parts off the title. The design commitment, then the inspection tests and analyses that would be used to verify the design description. And then the acceptance criteria for those.

The design description, which is what I'll cover first, basically looks at the high level

features and performance characteristics of each of the systems. And I think I'll get to this on some future slides here. But the purpose of that is to capture the most safety significant parts of the plan and put that into the Tier 1.

It contains descriptive text mostly focusing on what's going to be upcoming in the ITAAC. And then, as a matter of fact, when you see the examples you'll see that the descriptive text is exactly what's in the ITAAC. And there's reasons why we did that.

And then there's some supporting figures in tables that help out the closure of the different ITAAC.

On to the next one.

So when we're deciding now what to put into Tier 1 we have to decide what are the most important or the things that describe the plant as analyzed in the various safety analysis presented in the DCD. So we have to have our disclaimer up on front. You know, this all comes from Part 52 and is required to be there. And now we'll talk about what we had in there.

Anything safety-related, those features should be described in Tier 1. So the safety-

related features/functions are the things that are used in the safety analysis. That's what makes them safety-related is that they're used in the deterministic safety analysis and those would all go into Tier 1.

And the information that we put in the ITAAC is based on how important that specific feature was in the safety analysis. I think we'll cover that in a little bit.

Then we also have some nonsafety-related things that are in there, In an active plant such as ABWR or System 80+, which was certified many years ago, the safety-related features cover most of what you would have to have in Tier 1. Because the safety-related systems cover that broad range of plant performance. In the ESBWR and other passive plants we have our challenge because there's a demarkation that was set up through the various SECYs and other papers that the passive features cover the first 72 hours and then we could use appropriately qualified nonsafety systems to cover things that happened later. So I think by its nature I think in passive plants you'll end up with more nonsafety things that are in Tier 1 because it's the functions of the equipment that gets it

into Tier 1 rather than some specific safety-related versus nonsafety-related.

CHAIRMAN CORRADINI: So just to repeat this a different way is that what you're saying is as you go beyond 72 hours under design calculations, design basis calculations, certain things are brought in to still perform the functions that were not need in the first 72? That's the reason they're brought in from their safety function.

MR. WACHOWIAK: Yes, that's correct.

MEMBER STETKAR: A couple of questions on that I want a clarified kind of understanding.

I noticed that you have, for example, there are ITAAC for the main condenser, functions for condensing steam during abnormal operating events, main feedwater condensate systems for supplying feed to the boiler. That's not strictly post 72 hours. Do those come in due to the PRA? Do they come in from good practice? How did those get in. This has got to be a two part question, but I want to understand the first part first.

MR. WACHOWIAK: Okay. There are many ways that something that come in. And I think if we looked at any plant, we would have things like the main condenser for the steam condensing function and

things like that.

Things can come in because of the safety analysis, like you said. It could come in because of the safety functions performed post-72 hours. It can come in because of its importance in the PRA. It can come in because its needed to support a myriad of other regulations. Some of the things you're talking about in the turbine are there to meet GDC-60, I believe, for radiation releases during operation.

So there are various ways that you can get things into Tier 1. And it's supposed to be the top level things that help us meet those specific regulation. So there's multiple ways of getting in there, not only the safety-related nature of things.

MEMBER STETKAR: The follow up on that, I notice there are in -- and I can't remember whether it's Section 14.2 or Tier 1, it doesn't make any difference, there are a list of systems for which -- they're classified in the SER. They're called no entry systems. Basically they're just listed as a system, the system exists in the plant but there are no ITAACs specified for them.

A couple of them that came to notice in regards to the first part of the question are the

circulating water system and the turbine component cooling water system are no entries. There are no ITAACs for those systems. On the other hand, isn't the circulating water system required to condense the steam that goes into the condenser for that steam condensing function of the condenser? And isn't the turbine component cooling system required to support the condensate and feedwater systems for their feedwater functions?

So I don't understand why what we in the PRA world call the front line systems are in ITAAC and yet the required support systems are not. So I'd like to understand how that functional decision process works for getting things in or excluding things.

MR. WACHOWIAK: We'll talk about this in an upcoming side here.

MEMBER STETKAR: Okay.

MR. WACHOWIAK: But we use a graded approach to putting things into Tier 1. And we have to look at why the condenser is in Tier 1 and the support systems for why its in there. So when we're looking at the pieces of the ITAAC here, and I've got it up here in front of me, one of the ITAAC is played out for the dose calculations, which we

talked about there, the circulating water it doesn't effect that.

The anchors were the same for SSE, that's to contain vision products. Now what you're getting to is probably closer into number 2, the capability of the condenser to accommodate the bypass steam flow to mitigate abnormal events.

MEMBER STETKAR: Right.

MR. WACHOWIAK: And in this particular case the abnormal events that we're talking about is the feature of the condenser in those abnormal events is it's not necessarily to be able to be provided as the ultimate heat sink there. It's more to maintain its integrity and stay intact.

MEMBER STETKAR: But it wouldn't without condensing that steam. Not for very long, anyway. It would rupture disks and --

MR. WACHOWIAK: That's right. And that's accepted in ITAAC for six seconds.

MEMBER STETKAR: I'll ask you an easier one then that's a little bit less nebulous. What about condensate in feedwater with turbine component cooling water that's required to cool the condensate pumps and the feedwater pumps and keep them running? You can't say that they only need to run for six

seconds, do they?

And I would slow you down. I just wanted to make the point that I think there needs to be a little bit better description of rather than looking at simply systems and equipment, you should be looking at functions for the ITAAC. And those functions may extend all the way out through those support systems. And it wasn't clear to me going down through the list of what's in and what's out how that decision process has been made. But it certainly doesn't seem to be documented. In other words, there's nothing that I can read that says this is excluded for the following reasons. It just says it's exclude. It's just not necessary.

MR. WACHOWIAK: That's right. And one of the examples that I have later shows it in a slightly different form. And I'm trying to remember where we came down on this because we talked with the staff several times on how we should describe the no entry systems. And our process that we went through was if it didn't perform a safety-related function, then that's a candidate for no entry. Then we looked to see if it would have ended up -- if it made it onto the list for systems or equipment that required whether to treat them in the --

program, if it wasn't on that list, then it's a candidate for no entry. And then we look at which other specific regulations that it might be there to dissolve. And if we didn't have any other specific regulations, then it would get through that.

So the process that we're talking about does go through and looks at the functions of those. And sometimes things get on the list for what goes into ITAAC on the front line systems because of the question and answer process that we have with the staff. So that may not go all the way back through all the support systems.

I think --

MEMBER STETKAR: Just take it as an item to kind of follow up.

MR. WACHOWIAK: Right.

MEMBER SIEBER: Yes, there are arguments to support what they've done.

For example, the accidents are the classic Chapter 15 accident, design basis accident. You actually don't use feed pump during a design basis accident, but it's nice if you have it. And it's nice if you have all the equipment, then you wouldn't have the accident.

But in this particular design, the

design is passive and it doesn't require these active components. And that's why they're not safety-related.

MS. CAMPBELL: This is Patricia Campbell.

Just to further expand on that, remember that we're following the NRC. They set up the status as this graded approach because the ITAAC themselves are subject to the hearing process at the end of construction. So, you know, we would certainly having testing of these other systems as part of preop. So it's not that they won't be tested and that their function won't be verified. It's just that they're not at the level considered necessary for verifying at the plant safety systems and risk significant systems as designed to meet the requirements. And because it is at that level of being subject to a hearing you just don't want to put everything in there. We could certainly do that, but then you know that would create problems for our customers potentially.

CHAIRMAN CORRADINI: So let's just move on. But you can understand what I think John's after, some logical explanation of what's in and what's out.

MEMBER ARMIJO: I have another question along those lines. I was looking at your tables for the ITAACs and the systems and so on. And maybe I misunderstand, but you have a system in there that I thought certainly shouldn't be a Tier 1 system because it's an optional next to the hydrogen water chemistry. Now could you explain why it's in there in your tables?

MR. WACHOWIAK: The hydrogen water -- is it with a no entry system?

MEMBER ARMIJO: I don't remember, but it said optional and I believe it had ITAACs and --

MR. WACHOWIAK: The hydrogen water chemistry system is a no entry system. So it doesn't have any ITAAC.

What we tried to do for this is we went through all the systems that GE has in the master parts list so that in the end when the COL applicant looks at what thing they need to supply ITAAC for, on some of these systems we prescreened them and said that they're not going to need to add ITAAC for that system. So that's our recommendation to them that nothing needs to be put into their plant-specific.

MEMBER ARMIJO: Okay. I understand.

MR. OESTERLE: This is Eric Oesterle from the staff.

Just a clarification on the terminology "no entry." That has been a subject of discussion amongst the staff. And that terminology is changing. And what it really means is no ITAAC are required for the system.

MEMBER ARMIJO: Yes. I understand that.

MS. CAMPBELL: We're going to make that change.

MEMBER SIEBER: Still a good question.

MEMBER ARMIJO: Okay. But there's still some cleanup.

MR. WACHOWIAK: All right. And then so in general we'll try to get through the things on here.

The performance characteristic. What's supposed to be in the ITAAC is a configuration and in some cases the performance characteristics of the structure system components after we've completed construction. And in general these are supposed to be the fixed design features that remain in place for the lifetime of the facility.

We'll talk a little bit more later on the format of the three prong format of the ITAAC

and how we handle things that we know are going to change in the future and are controlled by some other process. But we'll get to that.

Go to the next one.

This is our laundry list of things that can go into the design description. And depending on the system you have one or more of these things that are in there. You know, we want to say what the name of the system is or what it covers, why the system is there, safety-related modes of operation, classifications that are important things like seismic, ASME, other things that would need to be required.

For some systems it's where it's located in the plant, if that's a critical characteristic for it.

Most systems have a functional arrangement and when we talk about our examples, the functional arrangement is presented differently depending on what kind of system it is. And we have some examples some there.

Where it gets its power sometimes in important for the system. And then also if there's some kind of separation requirement, is there independence in separation.

Other functions that have been determined to be important to meet:

Safety, which we knew from up front, but then there are other regulations that we're looking at meeting. In the most part, it's things associated with preventing either operational or post accident -- or mostly operational dose that bring more systems in.

Go ahead.

So in terms of our graded approach I think we covered this in a couple of questions here, but let me try to clarify that again.

If we have something that safety-related it's going to have a greater level of description and it's going to have more performance related ITAAC in the tables. If it's a nonsafety system, then it could have less coverage in ITAAC and it's basically the things that we have determined that those portions of the system help support the specific functions that brought it in.

And then nonsafety systems with no relation to safety or these things, we would end up having it as a identification, the system name, no entry like we talked about.

DR. WALLIS: I go back to the question I

asked yesterday. On these performance characteristics that you're going to check of these safety-related systems, some of them of the most important safety-related systems seems to have characteristics during accidents which you cannot check by testing.

MR. WACHOWIAK: That's one of the --

DR. WALLIS: But when you do test, when you look at them, seem to be what? They're sort of obvious things, but they don't have much to do with the accident situation.

Do you explore ways in which you could do tests which were closer to the real accident situation?

MR. WACHOWIAK: That is one of the great challenges for ITAAC in general and specifically for plants that use passive features to respond to accident. Because we're relying on the actual conditions during the accident to be the driving force for making the systems work.

So we have to provide a balance of type tests where we would test something in a laboratory and then using the quality programs demonstrate that the actually physically installed component matches what was done in a type test. One of the examples

that we talked about yesterday a little bit was the isolation condenser. We did a prototype test, full scale prototype test of the isolation condenser. And we are relying on those test results.

The way that the ITAAC is written for the isolation condenser is we need to go and measure the critical dimensions and other characteristics of the isolation condenser that we install and then compare it back to the type test. And we would use, in this case in the ITAAC inspection tester analyses, we would use an analysis that takes those as-built characteristic and then compares to what was done in the laboratory to give us the confidence that the as-installed equipment is going to perform like we expect it to.

Main steam isolation valves are another thing. And this is common to all plants, not just passive plants. But the performance characteristic of a main steam isolation valve is that it closes within in a certain amount of time, there's a range, under accident conditions. But we're certainly not going to test our as-installed valves under accident conditions. So we have to rely on laboratory tests, type tests in our vernacular in Tier 1. And then using the quality program show that the as-installed

valves actually match what was tested in the laboratory.

So to the extent possible, and remember that all of the ITAAC are required to be satisfied prior to fuel load, so we have to come up with ways to do these tests that can actually be accomplished with no fuel in the vessel. And in our particular plant, that posses a challenge because the only heat source to make steam or anything else really is the fuel.

MEMBER SHACK: Or the aux boiler.

MR. WACHOWIAK: Or the aux boiler. But the aux boiler is there to provide pressure. So we do have pressure tests in the ITAAC that we're going to use the aux boiler. But if we're going to talk about anything associated with rated steam flow, the aux boiler is not going to do it. Unless we had a nuclear aux boiler, but then we'd have to run with a different facility to put that in. And I think it might take longer.

MEMBER SIEBER: You do.

MR. WACHOWIAK: What was proposed what John was doing. We had to come up with a way to test, in this case here, one of my examples here, test the GDCS system without having the actual

conditions that we expected to operate in. And we rely on as-built dimensions and the as-built test results that we'll run in the test. And we'll have to combine with enough -- an analysis to show that we have the confidence that the systems will perform under those accident conditions.

MS. CUBBAGE: This is Amy Cubbage, NRO staff.

And we also need to keep in mind that the process doesn't stop there. This is just for the authorization to load fuel. THere'll be in-service testing, there'll be tech specs, there'll be the preop startup; all of those other test programs that are overlaid to give the assurance that the systems that will operate as needed when they're required.

MR. WACHOWIAK: Okay. What I have in the next few slides here, they're not in your handouts but you do have them in Tier 1. They're excerpts from Tier 1. And I want to go through and talk about some examples of what's in our design description at this point and how we present this. So these pages come directly out of Tier 1, so you all have them.

The first example system that I wanted

to bring up was the gravity-driven cooling system. Okay. We have, as we said before, the name of the system is there so it uniquely identified.

We have a short description of the system, what its purpose. And then we go through and we start listing what our design descriptions are. And each of these design descriptions are actually paired one-to-one with the ITAAC that we'll see later.

So in almost all cases the first design description entry is something to verify the functional arrangement. In a couple of more slides here I'll get to -- well, back. Stay on this one. I'll talk about how we define the functional arrangement in Tier 1.

Then next we have a bunch of other commitments. In this particular example we'll see for piping systems a set of information about ASME class requirements for the piping in the system and for the components in the system.

Then down past those we start getting into some specifics about whether it needs to have a seismic capability or not. And then we'll move to the performance characteristics. And they go on -- this one, I think there's maybe two or three pages

of design commitments.

So we're on our next page. A lot of the places in the design commitment we refer to tables that are in there. And the tables are there to identify which specific components we are talking about in this system. When you go into the nuclear plant for this system, you have the main components and then you have a lot of other things. There's vents and drains and test connections and all sorts of other things that really aren't the principal part of the design description in Tier 1. So what we've tried to do with the tables is focus specifically to which components we're talking about that are going to be validated in the different tests.

So if you kind of think forward to how we would be closing these things, for each one of those ASME entries it says for the components listed in Table 2.4.2-1 you do the following. One of the entries in this table corresponds to one test or one inspection analysis test that have to be performed. So when I say there's thousands of these things to do it's because we're expanding to cover the things on the tables.

So we say in text what their component

is. If there's a figure in the section, we will describe how the component is shown on the figure. In our particular application we don't have tag numbers listed in Tier 1 or, in most cases, in Tier 2. So this is just meant to identify how you find things on the figure and then the characteristics of this.

In this particular system we've got ASME code equipment. We have some or all of our equipment which is seismic category 1 and our information that relate to how we would go about closing the different ITAAC.

Go on to the next one. And I think this is the figure. So it's back at the backend of this section, but we've referred to that and you can see there's little circles there that identify what we're talking about, a pipe or a valve or something else.

And these are the high level characteristics of the system that are going to be verified for the functional arrangement. So the things that are on this figure are the things that are going to be verified that they exist and that they are in this approximate configuration.

So we would verify: There's the line on

here which says that the GDCS pool has a stainless steel liner. Part of the functional arrangement is to verify that it in fact does have a stainless steel liner.

The check valve comes before the squib valve is another part of the functional arrangement. And that we have one pipe that branches into two that connect into the vessel. Those are the types of things we'll be verifying in that functional arrangement.

Yes?

MEMBER BROWN: That's a nice simple system. It's a good figure. You can see what you're doing. Just to expand this to an area that's a little more complex, if you'll look -- I look for DCIS ITAAC section, and that's two lines. It says its subsumed under the ITAAC for ten, eleven or twelve other systems: nuclear monitoring, you know there's a shopping list of all the kind of stuff.

Now I didn't look at the figures yet, but as it starts I've got a figure here and a figure there, but nothing that pastes those together. But I'm just trying to relate a nice simple, easily understood example which you've used, which is fine, with a somewhat more complex integrated system which

is really touched by ten independent systems which then all get cobbled together. And that interface it's got to be difficult to define as to what you do.

That was question one.

MR. WACHOWIAK: Okay.

MEMBER BROWN: Question two was just for the simpleminded like me, there are -- I don't know how many systems there are in this. I lost count, somewhere over 50 going through pages of stuff. Then we talk about some that are subject and some that aren't. Is there a compiled or consolidated list that says here's all the systems in the plant and they're subject to ITAAC or they're not. Is that in here so that we don't have to derive that? Is it in there?

MR. WACHOWIAK: There is in Tier 1.

MEMBER BROWN: I didn't see it. So if it's there, I'd just like to know where it is, that's all.

MR. WACHOWIAK: It might be in Tier 2. Is it in the Tier 2?

MS. CAMPBELL: Table of contents.

MEMBER STETKAR: When I came up the turbine compound cooling water, there was a line

item that looked at that system and said nothing required.

MEMBER BROWN: I was looking for a table that says here's all the systems. Here's a column that says ITAAC, no ITAAC. You know, it's kind of the entry whatever you change the words are that we use, entry/no entry.

MR. OESTERLE: Eric Oesterle, staff.

There is a table that's provided at the end of the staff's SER with open items. And that's where you may have seen it and where we did identify where the systems had contained no entry.

MR. WACHOWIAK: Yes.

MR. OESTERLE: Correct. Keep going.

MEMBER BROWN: And there's a table?

MR. OESTERLE: That's it right there. Appendix A to the SER --

MEMBER BROWN: That is a list of every system and for the business of whether there's ITAAC or not. Are these just the systems covered by ITAAC, that will have ITAAC? What about the ones that don't say "no entry."

MEMBER BROWN: So that's a cute little word, that "no entry."

MR. OESTERLE: Yes. And where there's an

SRP section number identified those systems do have ITAAC.

MEMBER BROWN: Okay. That's fine. Thank you.

And back to my first question. He answered my second question, although I don't know why it wouldn't be in here as opposed to in the SER for the --

MR. WACHOWIAK: This is Wachowiak.

For the second question we needed to give the staff something to do.

MEMBER BROWN: Why didn't I figure that out.

Anyway, back to the first question --

MR. WACHOWIAK: But, no, our document does not include some concise list that says this has ITAAC and this doesn't.

MEMBER BROWN: Okay.

MR. WACHOWIAK: But our list is all of the systems that are associated with the design certification. And I think it's closer to a 100 or so systems that are in our master parts list.

MEMBER BROWN: Okay. Question one.

MR. WACHOWIAK: So question one is how do we do this for an I&C system?

MEMBER BROWN: Well, a or a collation or a consolation of a bunch that are then put under this umbrella of a Q-DCIS or a -- is it, an NBCS that's the nonsafety stuff?

MR. WACHOWIAK: Right. I have some examples coming up on that on one of the systems from Q-DCIS. I think I put the Q-DCIS system. But I do want to say, though, and this just is a historical thing, Q-DCIS and NBCIS are virtual systems in this plant. There are no components that are labeled C-63 for Q-DCIS.

MEMBER BROWN: I gathered that.

MR. WACHOWIAK: It's all in these other systems and they're just grouped as a Q-DCIS. And that's why that particular system shows up --

MEMBER BROWN: Oh, I understand that.

MR. WACHOWIAK: That's why.

MEMBER BROWN: But my concern then is how since I've got this 10, 12 and there's a list of systems covered.

MR. WACHOWIAK: Right.

MEMBER STETKAR: And there's a table that lists all those under the Q-DCIS paragraph. And there's a table that's right after that that says here's the stuff that's included in that. But

they're each individual systems, yet they do communicate in some cases each other, in some cases some other system which may be not included under this particular umbrella. And since it was not clear from the information as to how you throw that into the --

MR. WACHOWIAK: The particular systems are listed in other sections, and we do have an example of how that's presented in a functional arrangement and other things that we'll get to for one of those systems.

Hold off on that particular piece of the question.

In terms of how they touch other systems, I think this gets back to a couple of different things that we talked about yesterday. One of the things that we talked about yesterday was how it interfaces with the mechanical part. Because, you know, the instrument and control system can't do anything unless it's got some kind of sensor that connects into it, right? Or it's got some valve or other component that has to actuate. And those particular interfaces are covered in 2.2.15 right under the IEEE 603 compliance sections where we identify that the specific interfaces have

to meet the different -- the requirements independent, separation, all those kinds of things.

If you want to look at how the I&C system interfaces with the mechanical components, that's where you would look.

If we look at the individual I&C systems, there are many places in the ITAAC that are meant to demonstrate that these individual, especially in the safety-related I&C systems, that they don't communicate with the other systems.

MEMBER BROWN: I understand. That would be good.

MR. WACHOWIAK: So I think we have those interfaces covered. And if we wanted to go through a specific example, and I think we've done this with the staff several times, where we take a thread and we follow it all the way through all the different ITAACs and we hit everything that we need to to get to with this.

But you're right that especially in the I&C system and especially because so much of it is covered under this DAC, design acceptance criteria where we don't have all of the final detail design available that it takes some work to get through and demonstrate that the ITAAC that are in Tier 1

actually covers everything that's needed for the system.

But we've gone through that with the staff on several of these things where we've pulled the thread, taken a vertical slice down through and looked to make sure that we have everything that we need.

MR. OESTERLE: Eric Oesterle from the staff.

I just want to let you know that we do have several RAIs that are outstanding and open regarding some of the issues that we're still working with GEH on to resolve.

MR. WACHOWIAK: The specifics, yes.

And one of the things is in the area of the IEEE 603, the question came up as how exactly do we make sure that all of the requirements in that standard are covered. And we've gone back and reformatted that section. So in Rev. 6 it's not going to look exactly like what you have there based on the interaction.

MEMBER BROWN: You build a standard compliance matrix?

MR. WACHOWIAK: Yes.

MEMBER BROWN: Or something like that.

MR. WACHOWIAK: Compliance matrix. And the format of that is being updated to make it a little more transparent to what we intend to actually--

MEMBER BROWN: And where will that be?

MR. WACHOWIAK: That's going to be in 2.2.15

MEMBER BROWN: Of Tier 1?

MR. WACHOWIAK: Of Tier 1. That's an open item yet that Eric will talk about.

Okay. So we need somebody who has a password. Okay. All right.

So let me get through some of these. And, hopefully, when we go through in my examples from Tier 1, we did select one of the I&C systems to cover in this presentation.

And we go to the next one, which is a containment system. It's similar to the mechanical systems in how its presented, but its slightly different.

We have the design and the description up front what the system is supposed to do. And then the design commitments, many of them are associated with our codes and things here on the first page. That's similar to what we had before.

And for those that are trying to find on their computer, 2.15 is the system that I have up now.

Then look at the next page. I included the entire list here.

Next page. We have a table. And in this particular system the table is associated with the containment isolation valves. And so we have a table that lists all of the containment isolation valves that have Tier 1 requirements on them, similar to what we had in the GDCS with the components.

Go to the next page.

And the functional arrangement. In this functional arrangement you'll notice that there's a bunch of notes on the bottom. And the notes here are in the containment systems are where the cylindrical dimensions of these systems would be. So, for example, in our safety analysis the dimensions of the vent system in the pressure suppression containment are very important to the performance of that system. So on the functional arrangement we listed the number and diameter of the vertical vents in the flow area of the horizontal vent.

MEMBER BLEY: So those are the numbers

down there in number 13 or something?

MR. WACHOWIAK: Yes. And so these would be the important characteristics of this. And --

MEMBER BLEY: Why aren't some of these referenced something like above the wetwell floor? Is there a reference when you build the wet well floor that at the time there is reference points from which people measure?

MR. WACHOWIAK: Yes.

MEMBER BLEY: Do they just put a good old family ruler and make a -- on the end and pull it up and say, oh, okay, that's 6.3 or whatever? This isn't the reference point?

MR. WACHOWIAK: The reference --

MEMBER BLEY: Because that floor's not going to be flat.

MR. WACHOWIAK: That's right. And absolutely. I'm sorry, but I don't have example in here, but that's a very good point. Not everything's going to be flat, not everything's going to be perfect. And I'll hold that in my head for a second.

The reference is the inside -- how is it specified? The bottom invert of the vessel head inside, something like that. Anyway, so -- right

here is zero. And so everything's measured --

MEMBER BLEY: From the inside.

MR. WACHOWIAK: Yes, from inside the vessel.

MEMBER BLEY: So you measure from the inside the vessel outside the wall and down to the floor?

MR. WACHOWIAK: Yes. That's the reference. And later what I'm sure will happen is that, like any existing plant, there will be various reference markers placed in the building so that when you go and do measurements you measure from the reference points that already set.

MEMBER BLEY: Is there an ITAAC that covers the certifications for the reference point?

MR. WACHOWIAK: That's a good question. And, no. However, there is an ITAAC that says that the floor on the suppression pool needs to be at a specific elevation. And in closing that ITAAC you would have to -- the documentation that concludes that would be to include the method for how you calculated that and you got to that point.

It's like going ahead on my presentation, everybody has read the ITAAC --

MEMBER STETKAR: Right. Absolutely.

MR. WACHOWIAK: It's parts of the ITAAC--

MEMBER STETKAR: All 689 pages of it.

MR. WACHOWIAK: That's right. And you'll see that each one of those tests is typically is one sentence, sometimes there's two sentences. That is not the extent of the instruction for how you would do that test. Someone has to write a procedure that says how you would specifically get to the conclusion that you want to get to. And that procedure is going to be part of the closure package. So that review that says here's the floor, it's at this elevation would go all the way through to the process, the procedure and how that would measure. And those are all the things that the inspectors can challenge when they go back and look at the closure of that ITAAC.

One of the other sections I'll mentioned here I don't have an example of the building ITAAC, mainly because the building section contains sensitive -- unclassified, but sensitive material. And since we're in an open meeting I didn't want to put anything on the slides that would cause us to go closed.

Almost everything in the ITAAC has a

tolerance on it. And it's especially prevalent in the containment section where it says the walls need to be this thickness plus or minus whatever. And that's what this was doing here.

Can you go down to 2.15 and let's see where -- because I don't have the --

MS. CAMPBELL: For the building?

MR. WACHOWIAK: Yes, 2.15.

Okay. It's hard to do on the screen there. But in this particular case the horizontal vent it says greater than or equal to. So the tolerance is set up, it's a one-sided tolerance. It would have to be at least size.

MEMBER STETKAR: Up at the top where it was just X number meters above the wetwell floor? I understand the greater then or equal to.

MR. WACHOWIAK: Right.

MEMBER STETKAR: That sets its own standard.

MR. WACHOWIAK: It's just that one says--

MEMBER STETKAR: I'm just asking physical tolerances, and I didn't see one.

MR. WACHOWIAK: And what we tried to do in all of these is that we would have something or

there wouldn't be an absolute number. What I saw there was a greater than on it.

MEMBER STETKAR: I'm just looking at the next three items two bullets below.

MR. WACHOWIAK: Okay.

MS. CUBBAGE: This is Amy Cubbage.

If you're looking for an example, Table 2.16.5-1 has the nonload dimension and then has a tolerance in the far right column of a plus/minus.

MEMBER STETKAR: I don't disagree. It's just that it seemed to be absent here, that's all.

MS. CUBBAGE: Oh, no. I --

MEMBER STETKAR: Wherever it's supposed to be, it's --

MR. WACHOWIAK: Okay.

CHAIRMAN CORRADINI: You can proceed.

MR. WACHOWIAK: We'll proceed. I understand your question. The idea there was that we would have tolerances on these things so that when they're actually constructing something, you know we're not constructing a computer model which can be very accurate. We're constructing an actual building, which is a little less tolerant.

So let's go on then to the next page. This is one of R&C system and how it's presented.

This is in 2.2.13.

MR. KIMURA: Steve Kimura.

2.2.13 is one of the one of the Q-DCIS systems. Q-DCIS by itself is a very complex system and comprises both the reactor protection system and the engineered safety features safety system --

MEMBER BLEY: I'm trying to find it.

MS. CAMPBELL: It's 2.2-102.

MR. WACHOWIAK: That's the page.

I found yesterday that almost everybody had a copy of Tier 1 with them either on their computers or in hard copy. So I didn't really worry about putting extra paper.

CHAIRMAN CORRADINI: Keep going.

MEMBER BLEY: Start over. I missed the first part trying to find it.

MR. KIMURA: So Q-DCIS comprises two different parts. There's the reactor protection system, there's the engineered safety features system. The SSLC is the engineered safety features system part of Q-DCIS. And it performs various functions.

There's multiple ways to try to kind of describe how this system works, and we thought the best way and probably the most straightforward way

would be by arranging this section in a series of tables.

The first table, Table 2.2.13-1, is the functional arrangement. And it says the SSLC comprises four redundant, safety-related, Seismic Cat 1, divisions of trip logics and trip actuators. But what we've been talking about here are really the command features. There are sense features, the senses that have to come into the system, obviously. And there are execute features, the actuators, that also have to be manipulated by the command features.

MEMBER STETKAR: Are they independent?

MR. KIMURA: They're independent.

MEMBER STETKAR: It didn't say that in the table, that's why I asked. It said they're redundant but it didn't say they were independent.

MR. KIMURA: Right.

MEMBER STETKAR: They do not go hand-and-hand in all circumstances?

MR. KIMURA: Yes. The design criteria for the safety systems follow the requirements IEEE Standard 603. And a demonstration of compliance with 603 is done in a separate section of Tier 1. In section 2.2.15. And that was done because there is a whole myriad of requirements that had to be

applied to each of the safety systems in various degrees.

MEMBER STETKAR: Yes, but 603 says it needs to be redundant also.

MR. KIMURA: Right. It says that it has to meet --

MEMBER STETKAR: -- high level structure or--

MR. KIMURA: It has to be independent. It has to be of sufficient quality. It has a whole bunch of other things. It has to be qualified for the environment in which to operate.

MR. WACHOWIAK: Just to make sure that we're all on the same page with this, this particular entry there for the redundant power supplies is within the division. The redundant power supplies within the division do not have the same independence requirements as the power supplies amongst the divisions.

MEMBER STETKAR: And a division means one of the four --

MR. WACHOWIAK: One of the four. So what we're saying here is that --

MEMBER STETKAR: I'm glad you said that because it wasn't obvious.

MR. WACHOWIAK: Yes. Each one of the four divisions has two power supplies.

MEMBER STETKAR: That's fine. That's okay.

MR. WACHOWIAK: So the independence requirements under IEEE 603 is different than amongst --

MEMBER STETKAR: Either from Train-to-train or division-to-division, channel-to-channel however you want to phrase it?

MR. WACHOWIAK: Yes.

MEMBER STETKAR: As long as you don't shift the power from -- allow the power from channel A to be used in channel B?

MR. WACHOWIAK: And that's correct. And we verified that under the IEEE 603 that A doesn't get shared with B or one doesn't get shared with two.

MEMBER STETKAR: Okay. I guess I would have shown four redundant independent. But you say it's assumed in 603 --

MR. WACHOWIAK: Redundant safety-related power supplies are provided for each division. So each division has two power supplies is what we're trying to say there.

MEMBER STETKAR: That doesn't mean they're independent downstream of that in the operational functional stages.

MR. WACHOWIAK: Right.

MEMBER STETKAR: Which is also a requirement of IEEE 603. And that's why I used the word "independent" more broadly because if you mix the occasion from channel-to-channel depending on how that's done, you can compromise the independence and the redundancy of those independent trains theoretically.

MR. WACHOWIAK: Yes. And that's actual, it's happened before.

MR. KIMURA: The power supplies are also discussed in greater detail in another section of Tier 1. So in this section the requirement for the system is that there be redundant safety-related power supplying the safety-related system by division. And by redundant in this case is two banks of 36 hour batteries that are tied together to give you the 72 hour power that we required.

MEMBER STETKAR: So you have to have both?

MR. KIMURA: You need both to get 72 hours.

MEMBER STETKAR: But of the redundant power supplies to get the full 72 hours?

MR. KIMURA: Right. So in that sense these two power supplies are not truly independent. But they are independent for the division.

MEMBER STETKAR: No, I understand.

MR. KIMURA: Because we have eight sets of batteries for the entire SSLC. So each division will operate for 72 hours.

MEMBER STETKAR: Are you saying that the power supplies can't supply the full functionality is why?

MR. KIMURA: Right.

MEMBER STETKAR: So in reality you have technically as one power supply? You've got a half a power supply for half the time?

MR. KIMURA: Right.

MEMBER STETKAR: Because fundamentally they're not redundant if they're not full capability. So that word is kind of inappropriately used in that case. I'm not sure, you know, if you have one power supply that's just rated to supply the whole thing, that's probably okay also. Because you've got four channels as long as you maintain their independence. And you only need two out of

the four or something like that to do what you're going to do.

MR. WACHOWIAK: But there are other technical reasons why we want to do the way that we==

MEMBER STETKAR: That's fine. That's okay. I'm not arguing with that.

MR. WACHOWIAK: And this is not say whether --

MEMBER STETKAR: I'd be advertising where they're not fully redundant.

MR. WACHOWIAK: And this will tell what we've done and why.

MR. KIMURA: Yes. But when you look at it, there will be two.

So the functional arrangements are intended to be inspection only item. You look at, you can see that it's there. That these features exist in the system.

In the next table, 2.2.13-2 representing really the essence of the safety-related functions that this system has to perform. And we have three columns in this table.

The first one is the safety-related function. Initiation of, say, GDCS injection is one

of the functions that SSLC does.

It's initiators would be the reactor pressure vessel water level low, level 1.

And there are interfacing systems. And the interfacing systems are where you will find some of the other parts, either the sense for the NBS system, the sensors would be in NBS, and then the interfacing actuators would be in GDCS. So if you wanted to go look and see where the actuators are tested, you'd go back to the GDCS section that we just covered a few minutes ago.

But this table kind of encapsulates and just distills down the things that this box has to do.

The next table, 2.2.13-3 delves into some of the more esoteric features of the system. Some of the manual control features, some interlocks. One of the interlocks you have to do before you actuate GDCS is you have to depressurize the reactor pressure vessel. So we have interlocks that open the various groups of the safety-related valves or the safety relief valves or the depressurization valves. And those occur based on certain kinds of layers that are described in Tier 2.

And then there are operational and manual bypasses of the safety-related functions. And so those are listed here as well.

MR. WACHOWIAK: So one of the things to remember from this is the I&C systems we don't use a figure to describe the arrangement. We use tables of the features for the systems to describe the arrangement.

This example that I've put up here is an example of one where we don't have any ITAAC. And as Eric mentioned, it's still in discussion about how we present this material. The way its presented in this particular system goes to that thought process that we have. Its not safety-related, it doesn't meet the requirements, therefore it doesn't need to have any ITAAC. But specifically how we present this information is still under discussion.

MEMBER SHACK: Presented in terms of explaining what you just said or presented in terms of the bottom line?

MR. WACHOWIAK: In terms of the bottom line. What needs to go into the Appendix of Part 52. The thought process is described in 14.3 in the DCD.

MEMBER BROWN: Somebody, one of you,

made the comment earlier that says no ITAAC are required for the system. Okay. You've now answered part of the question as to how you know yes or no. But somebody made the comment that there is or there are tests on acceptance criteria. Somewhere this system has to be tested.

MR. WACHOWIAK: That would be tested in the startup test program.

MS. CAMPBELL: In preop or startup.

MEMBER BROWN: So there's no test prior to operation for this system?

MEMBER SIEBER: There's construction tests. Construction tests make sure that the equipment performs as a function. But there's not necessarily -- some systems aren't necessarily complete. They don't necessarily prove their pump can pump to a certain head or something like that. It does prove that when you turn it on, water comes out of that pipe over there, so to speak.

So everything gets tested in some way or another.

MEMBER BROWN: But there's got to be acceptance criteria for that also. For certain things. You got to have a flow rate, and you got to have a response, no more than -- blah, blah, blah,

all that kind of good stuff.

MR. WACHOWIAK: That's outside of the ITAAC process. Because there are other tests other than ITAAC.

MEMBER SIEBER: Right.

MR. WACHOWIAK: These are supposed to prove the most safety significant portions of the certified design.

Okay. Let's move off of the design description phase and let's go into the ITAAC phase. We covered most of this yesterday, so I'll probably go through quickly on this.

The ITAAC defines the things that we want to confirm. Okay.

The table format for the ITAAC is three columns. This was described in all the guidance there.

We have the design commitment. And as I mentioned before, the way we present this is the design commitment exactly mimics those numbered bullets from the design description. So there's no question of did we cover everything in the design description in the ITAAC. We did because they're exactly the same.

We have the inspection, tests or

analyses description in the second column.

And then the acceptance criteria in the third column.

And like we said, all of this needs to be completed, the entire set of them, prior to the loading fuel.

Next page.

Okay. This comes back to some of the things that we talked about earlier. When we're going to do the tests, if there is a test involved there, we're going to make sure that that test is contained in the initial test program that we talked about earlier. So we talked about that overlap. The procedures will be handled in the same way that we've described in the initial test program. So if you don't see a description of the specific ITAAC, we didn't mean they would all be described there. But the process for doing the test program would be the same.

CHAIRMAN CORRADINI: Just to make sure, just to say it back to you so I get it right. Your basic point is that somewhere in the test program there must be a one-to-one mapping of if there's going to be a test, it'll fit somewhere in the ITP that we saw under 14.2? But those were that

inspections will be inspections. Those that are analyses, there might be a separate subtest -- I don't want to say subtest, but a separate test which then analyses will satisfy the ITAAC?

MR. WACHOWIAK: I think that that's mostly correct with one possible exception here. The initial test program itself may not -- the thing that you saw on 14.2 may not cover everything that's in the ITAAC. But when we put the actual list of tests together and write the procedures for the test, it's going to be all handled the same way with the same process that's ascribed in 14.2

MS. CAMPBELL: Right. The point here is that we won't put the plant in any condition that's not already in alignment with procedures. In other words --

CHAIRMAN CORRADINI: But to satisfy an ITAAC?

MS. CAMPBELL: Right, to satisfy an ITAAC.

CHAIRMAN CORRADINI: Yes.

MS. CAMPBELL: It's not that if you go to 14.2 that you're going to see every ITAAC test in--

CHAIRMAN CORRADINI: No, I didn't expect

that. But conversely what I guess I'm saying is somewhere in the ITP there will be a set of tests or smaller tests that fit in with analyses that will have to essentially satisfy your --

MR. WACHOWIAK: Yes, that's correct. And we're working with our partners right now to figure out how to layout all the inspections and tests. Because you have to be able to get to the things you're going to inspect and test. And if one of the things that you need to inspect is a pipe that ends up being buried in the ground or something like that, you have to inspect it before its buried or else you'd have other issues.

So all that is going to be described in that process. And like Patricia said, we'll try to do these ITAAC, inspections and tests when the ITP has the conditions in the plant for doing those tests.

MEMBER BROWN: I guess I'm trying to take the ITAAC part that we were talking about and if you look at 14.2 there's a set of construction tests, preop tests and doing startup tests. You know, there will be a fuel loading and doing the startup tests. All of the ITAAC has to be done before completed, signed off and blessed before fuel

load. At least that's the way it read.

MR. WACHOWIAK: That's the logic.

MS. CAMPBELL: That's the requirement.

MEMBER BROWN: Now is it my understanding then that as the ITAAC, the requirements specified, the acceptance criteria for the inspections and tests will be accomplished during either preoperational tests or actually specified functional inspections? I mean you have to generate the results with some type of a test, and the only test I see prior to startup are the preoperational tests and/or the construction tests, which occurred before then. So my interpretation of that was that these acceptance criteria and the tests that you specified to do that have to be subsumed or incorporated into either construction tests to satisfy -- having signed off by the time you get up--

MR. WACHOWIAK: Yes. That's not only signed off, its signed off and submitted --

MEMBER BROWN: Yes. It's verified -- seal of approval, whichever ones are required. So that's where these fall in? I mean, there's not a separate set of ITAAC specified --

MS. CAMPBELL: Yes.

MEMBER BROWN: -- test procedures? They are encompassed within the existing construction and preop test program

MS. CAMPBELL: Not necessarily.

This is Patricia Campbell.

There could be tests in the ITAAC that are not in the specified initial test programs identified in 14.2. It's not a one-for-one match. In other words, there are initial tests in the ITP that will verify some of the ITAAC. Like we may have a 100 --

MEMBER BROWN: That's different than preop tests?

MS. CAMPBELL: I mean, we mentioned the NEI guidelines document, and I've been working on that as GEH's rep for how do we close the ITAAC. And certainly there will be portions of the initial test program testing, maybe three or four pages would be pulled out as one ITAAC verification. And that would be the documentation that would verify that ITAAC. But there may be ITAAC testing on measurements or inspections that will not be identified as part of the ITP. There may be special tests.

MEMBER BROWN: But that's what I said. If those items that are measurements of inspections,

obviously, just accomplished in some -- via some different mode.

MS. CAMPBELL: But what this bullet means is that we won't violate any of the conditions of the initial test program if we do any of those special tests. But that's really what this bullet means is that we would write any of these special ITAAC tests in accordance with the initial test program.

So I mean what you're saying kind of is true in that it won't violate any of those types of conditions.

MEMBER BROWN: Well you can't have underground test program that's running on the side while you start this construction preop test. I mean that just doesn't make --

MS. CAMPBELL: What we --

MR. WACHOWIAK: I think where we are right now in this part of the conversation is discussing how we're going to implement the total set of ITAAC closure and that's not really the scope of the design certification at this point. As we can see, it's a very interesting conversation and there are many industry representatives dealing with how we're going to do this. You bring up a great

point. You don't want to have two programs running at the same time to do similar sorts of things. On the other hand, what you do with the acceptance criteria for things that are in ITAAC could be different than the way you would disposition things in the initial test program. So we'll have to coordinate that, and that will be done. But that's really not a topic for certification.

MS. CUBBAGE: The bottom line is they have to do both. And if there are things that are overlapping, it would be hard to believe they wouldn't take credit for the preop tests to fill in the ITAAC.

MEMBER BROWN: I'm looking there's got to be something that's formal, that's understood, laid out, people expect you're supposed add more, the NRC staff will look at it --

MS. CUBBAGE: And there's a whole effort going on outside of this program with what's going on here today.

MEMBER BROWN: I just don't see that. I see ITAAC as kind of sitting off on the side with maybe something being caught up in the initial test program. In whatever form it is, construction, preop, whatever.

CHAIRMAN CORRADINI: I think we're going to have to proceed, but I think what I hear from you and staff is that you guys are aware of the fact that there are places where they mesh and there are places where they might not necessarily mesh. And you're discussing on how to property mesh them And in some sense it's out of scope for the certification.

MS. CUBBAGE: Yes. The certification says what and that question gets to how.

MEMBER BROWN: Well, I would argue it's outside the scope of the certification. If you don't have a formal method, in other words, if I call it an underground sidebar testing process, then that means you can't put the Betty Crocker Good Housekeeping Seal of Approval on it very well. I mean, something has to be within the control documents of how the plant was tested, period.

MR. WACHOWIAK: Absolutely.

MEMBER BROWN: It can't have something different. And that's part of scope of certification as far as I'm concerned. If you can't certify it, it doesn't work.

MS. CUBBAGE: The certification --

MEMBER BROWN: I understand you got to

get to a closure process. But you can't have certification of this stuff that people are dabbling with on the sides. I use that word carefully.

MR. OESTERLE: Eric Oesterle.

MEMBER BROWN: Maybe it's not carefully enough.

MR. OESTERLE: If you recall the discussions yesterday afternoon, it's the COLs that have the responsibility to implement the ITAAC and to demonstrate that they have successfully closed them out. So we anticipate that the COLs will establish an integrated management program for closing out all of the ITAAC which would cover how they take credit for portions of initial test procedures and preop procedures, construction procedures to verify that certain ITAAC have been closed out.

And so staff agrees with that GEH have made that that aspect of it is really the responsible of the COL applicant, not for design certification.

CHAIRMAN CORRADINI: Okay. Thank you very much.

MR. WACHOWIAK: All right. The last thing I want to point out here is something we've

talked about before. We do have to do some analysis, conversion, extrapolation sometimes to get to the acceptance criteria.

We'll go on to the next one here. This is taken out of our document. It's the definitions of what the inspections, tests or an analysis would be.

I don't know that if we go through in detail on this. Let's go on to the next one here to the examples that we have from the document of some of these ITAAC.

You see the three column format that we have. Remember I said that they match one-to-one. And we did our best to make that all match up. And in Rev. 6 definitely will. There were some places where -- not many by Rev. 5, but there was a lot of it.

The first one would be the functional arrangement. It's normally specified as an inspection. You go and you look and you measure things. And you check it in accordance with the figure.

Go onto the next page here, 8a which is one of them that I think we talked about yesterday a little bit. That the function of the system, as a

functional ITAAC, it's supposed to provide sufficient water to keep the core above the fuel for 72 hours following the LOCA. The inspection is one of the longer ones here. It's a couple of seconds description of a test that would be performed and then the acceptance criteria is, since this one has to be translated using an analysis, the acceptance criteria is the report that takes analysis and confirms that we've met requirements.

DR. WALLIS: It seems to me that these analyses of the test which will be performed are a key element.

MR. WACHOWIAK: Yes.

DR. WALLIS: That's where, you know, we presume we don't have any input. But that's the key. If you analyze it appropriately and relate it to the safety function, you haven't really proved that it works.

CHAIRMAN CORRADINI: I guess, Graham, if I understand your worry I think in the COL is where we will have --

DR. WALLIS: The COL will see that, yes.

CHAIRMAN CORRADINI: Is in the COL is where we're going to have to ask more detail of how the--

DR. WALLIS: Are you going to analyze the tests.

CHAIRMAN CORRADINI: -- test is going to be connected with the analysis.

DR. WALLIS: Right. Right.

MS. CUBBAGE: No.

MEMBER SHACK: These are resolved before fuel load after COL. We will not see that.

MS. CUBBAGE: The content of the ITAAC is being resolved in certification. Yes, and the actually fulfillment of them is post-COL issuance. So --

CHAIRMAN CORRADINI: There will be no discussion of the ITAACs during the COL?

MS. CUBBAGE: Only the site-specific ITAAC that are added in the COL phase. So there should be adequate information in Tier 2 to support the basis for the ITAAC and, hopefully, for us to understand how you would fulfill this ITAAC.

MEMBER BROWN: The table that said the GDCS injection lines provide sufficient flow to maintain water coverage for 72 hours. That presumes you have to assume some drainage or some water escaping somewhere, I guess, or evaporating whatever the case may be.

MR. WACHOWIAK: Yes.

MEMBER BROWN: But there's nothing in here talking about what that flow rate is. And where are the explicit acceptance criteria for this particular design? Are they located somewhere? Are they to be --

MR. WACHOWIAK: Yes. That's in Tier 2 in the safety analysis we describe the flow rates from the analysis that are in the system.

MEMBER BROWN: Shouldn't that reference those?

MR. WACHOWIAK: Well, you don't make an explicit reference back to Tier 2 from here. And there is legalistic reasons for why that is. If we make that reference from here into Tier 2, when this gets published in as an Appendix if it references that it would reference somehow get a different pedigree.

MEMBER BROWN: Well then why not put the numbers in?

MR. WACHOWIAK: Because it depends on the condition.

MEMBER BROWN: Or an acceptance factor--

MR. WACHOWIAK: If we have accident scenario, you might need one flow rate, in a

different accident scenario you might need a different flow rate. It depends on what the pressure distributions are.

She's saying how we would look at this in terms of you would get the flow rate and then you would take it back to analysis.

In this particular case the conditions are quite different in the plant from what the conditions in the safety analysis are. So what we're doing is we're measuring the flow rate and the characteristics of the system and then taking that back to the safety analysis computer code that we used in tier 2. And using the same sort of a simulation you would demonstrate that the characteristics of the system as measured from this test meet the characteristics of the system that you have in safety analysis.

This one relies on analysis. Now I want to --

MEMBER BROWN: I have no problem with the analysis. I just want to make one -- but I presume staff, I presume the NRC gets to see and understand what those numbers are, right? That you agree and approve with whatever you approve based on what you see in that analysis? If this is the only

legal thing, and so I'm just saying you know three or four or five years the second site comes along and somebody decides to use a different number, how is that controlled? Because there's no reference, there's nothing that puts it in --

MS. CAMPBELL: This one doesn't have a number because you obtain the number by the test. And then you do --

MEMBER BROWN: That's not what it says.

MS. CAMPBELL: Yes. You do the flow rate and you measure the flow rate. And then you take the flow rate over here in the acceptance criteria, just take that flow rate, you observed rate and then you analyzed it to make sure that you can cover the top of --

DR. WALLIS: This is backwards.

MEMBER BROWN: No. It gets converted.

DR. WALLIS: It seems to me it's backwards. You've already used your LOCA analysis to predict what the flow rate needs to be in the test.

MEMBER BROWN: Otherwise you don't have a pump that works.

DR. WALLIS: You have a measurement which is direct of what you're actually measuring

because otherwise it's a very remote connection.

MR. WACHOWIAK: That's all correct. And the thing that we have here on analysis is it gets back to what we talked about risk in terms of getting to the end.

MEMBER BROWN: I'm not arguing the analysis part. Maybe I didn't say it clear enough. The point being is that you said it, we accept it and now some years later somebody, another applicant who builds another plant and he starts using a different number. There's no control over that number. That acceptance criteria that was put in place is now changed without anybody ensuring on the government side, NRC side, that that new number actually satisfies the requirements for that plant.

MS. CUBBAGE: Well it did change.

MEMBER BROWN: It's up to the licensee and GEH.

MS. CUBBAGE: In this case the acceptance criteria is that the top of that core would be covered if you achieved that flow rate that's measured.

MEMBER BROWN: But would you get to see it in the second or third round, that's my understanding?

MS. CUBBAGE: I don't know --

MR. WACHOWIAK: Every plant has to satisfy the --

CHAIRMAN CORRADINI: I think that's the disconnect. I think that's the disconnect that I'm hearing in the conversation. I think this acceptance criteria is generic to the design so that means every applicant in every build will have to show a test or a test analysis protocol that staff will look at and approve to go forward.

MEMBER BROWN: I didn't think they had to do all of those things --

MR. WACHOWIAK: This is why. It was only the first of a kind thing that don't get repeated.

MEMBER BROWN: But that's not --

MR. WACHOWIAK: This is not a first kind of thing.

MR. OESTERLE: Everyone of these is done by every plant.

MEMBER BROWN: Everyone of them approved by NRC?

MR. OESTERLE: Yes.

CHAIRMAN CORRADINI: Let me just interject. As I understand it there were three or

four or five, I don't remember the number, that are first of kind. Except for those, all of these must be done every time a new applicant comes up with a COL.

MS. CUBBAGE: This is Amy Cubbage.

Those first of a kind fall under 14.2 the initial test program. All of the ITAAC apply to every plant.

MEMBER BROWN: Every time?

MS. CUBBAGE: Every time.

MR. WACHOWIAK: And every one of these is subject to inspection in every plant.

MEMBER BROWN: If you got a standard plant why do you have a different number on some subsequent COL holder?

CHAIRMAN CORRADINI: Just to verify that in fact he put the plant together properly.

MEMBER BROWN: So I understand that point. But you got to have something to say it's okay. Why would the number be a 100 gallons per minute this time, and it'd be a 150 some other time and maybe only 50 the time after that? How do you walk your way through that?

MEMBER STETKAR: I don't think that's what you're saying.

MR. WACHOWIAK: Yes. What we're trying to say is that in this particular case and in many of the cases where we used something like this there are many parameters that influence whether or not you meet the requirements. And what we tried to do in these cases is if we had gone through and said that the pipe has to have this diameter and the run can't be any longer than X, and --

MEMBER BROWN: That's too detailed. I agree with that.

MR. WACHOWIAK: And we get through all those details and we miss one of those, but we can still keep the core covered, then that should still be accepted. So what we tried to do here is to say what the acceptance is. So you do this test and the combination of all the as-built parameters. As long as that demonstrates that we meet the objective, then the individual components that we get to there is satisfied.

One of the things that I was talking about risk in this is if someone wants to challenge this particular ITAAC, this is a more easily challenged ITAAC because you can challenge the test, you can the methodology, you could challenge the calculations when you're looking at whether or not

we've met that versus the other ones if we said the pipe has to be this diameter, well that's hard to challenge. Because you can measure the diameter. But the pipe length to the run can't be any greater than this. Okay. Those are much more certain. But it turns out where do we want to have the certainty of this thing.

MEMBER BROWN: You got to understand, I'm not challenging that part of it. I'm just -- it's the right way to do it. I mean, you want to keep the core covered. That's the right acceptance criteria. My disconnect was how after the initial plant and you do subsequent standard and you'll get different COL holders or applicants apply, they get their permits and off they go, how do you ensure that the same -- the analysis, the results of the system's design? Are they going to design the system differently than the previous guy --

MR. WACHOWIAK: But as we talked about before, there's construction tolerances --

MEMBER BROWN: -- we evaluate it every time.

MS. CAMPBELL: And remember we are saying it only has to provide sufficient flow. That flow could be a lot more --

MEMBER BROWN: I understand. Yes, I understand --

MS. CAMPBELL: And what we're really trying to verify --

DR. WALLIS: Can I have a follow on question?

CHAIRMAN CORRADINI: Not yet. Not yet. I want to make sure we're clear.

So I think you see his concern. But I think at least the starting answer is that every applicant must meet the ITAACs.

MR. WACHOWIAK: Yes.

CHAIRMAN CORRADINI: The analysis may differ, but then staff is going to have to have a conversation with the applicant. Because if first plan up, and GEH with that first plan has a certain analyses procedure, I would be guessing that the next one might want to follow that procedure if the first one's successful. So I think there will be a history developed. But I don't think it's reflected in the acceptance criteria except at this top level.

MR. WACHOWIAK: That's correct.

MS. CAMPBELL: Well, some of the acceptance criteria are written --

CHAIRMAN CORRADINI: I think you should

say yes and let's move on.

MR. WACHOWIAK: Yes.

CHAIRMAN CORRADINI: Okay.

MR. WACHOWIAK: I think that's the correct concept there is that that's what would be done.

DR. WALLIS: As a follow up to the same question. I'm confused about this first of a kind nature of the GDCS and PCCS. Because when the read SER, the earlier section 14.2, the staff seemed to be claiming that the GDCS and PCCS system tests are first of a kind tests.

MR. WACHOWIAK: There are.

MS. CUBBAGE: There are.

MR. WACHOWIAK: And those have been completed actually.

DR. WALLIS: Well I thought you had just said that they work.

MR. WACHOWIAK: They were completed in a test facility.

MR. OESTERLE: There are first of a kind tests associated with the ITAAC.

MR. WACHOWIAK: But that's not these.

DR. WALLIS: But they're not these.

MR. WACHOWIAK: These are not first of a

kind. These are each of a kind tests.

DR. WALLIS: So they are first of a kind in some other context, but not in --

CHAIRMAN CORRADINI: Right. Yesterday as we went through it they identified specifically they're saying for first of a kind. But these will occur every time.

MR. OESTERLE: Right.

DR. WALLIS: So these are not first of a kind?

CHAIRMAN CORRADINI: Right. There are other ones. For example, there was something to do with -- but they went through specifically. There were four. I can't remember the ones for the isolation condenser and et cetera.

MR. WACHOWIAK: These are done every time. Because what we're verifying here is that the as-built plant meets the requirements set forth in the certified design. So it has to be verified every time. And we tried to write these so that they could be verified every time. And I hope we succeeded because you can't load fuel.

We'll go to the next page here. And I think we're at one that was more traditional. We talked about this before. FAPCS is a pump system.

It's a little easier to come up with a flow rate for a pump and easy to test. And we'll see in 7a there, in 7a and 7b we put down some conditions and we actually have measured flow rate there for the pump.

So this applies less on the natural forces that are going to be influencing what the flow rate would be.

DR. WALLIS: That's an extraordinarily accurate measurement 1998.42 gallons per minute.

MR. WACHOWIAK: Yes.

DR. WALLIS: It's extraordinarily precise.

(Simultaneous speakers.)

MR. WACHOWIAK: I understand. And if you look through you'll see some other things. I think we have our feedwater nominal flow rate has something like eight significant figures on it.

DR. WALLIS: Just --

MR. WACHOWIAK: Understood.

Let's move on to the next page. And I put an example of something for a power system. Once again I think the one that I was looking at was number four at the bottom here. And this was meant to show that the independence here when you put a test signal in on one division that the output only

shows up in that division. It doesn't show up anywhere else.

MEMBER SIEBER: I'm still trying to find it, so you're way ahead of me.

MR. WACHOWIAK: Oh, that's 2.13.1.

MEMBER SIEBER: I got the page now. I finally was able to read it.

MR. WACHOWIAK: So that was the intent here is to show that we do have these independent tests scattered through the different ITAAC.

MEMBER STETKAR: You got figures in there that -- there's some figures following this. Are those intended to reflect your independence or redundancy or --

MR. WACHOWIAK: That's their functional arrangement.

MEMBER STETKAR: So that the detail is not sufficient, is that what you're saying?

MR. WACHOWIAK: That's meant to show the basic layout of the system. You wouldn't find that detail.

MS. CAMPBELL: This is a test.

MR. WACHOWIAK: And this is -- so go on to the next one. I think the next one is -- it is containment. Once again we have tests to confirm

the different things that are in the design commitment. One particular here that I want to talk about was the number 8. And this one is a structural integrity test and will be basically pumping up the containment to 115 percent as required by the ASME code. And demonstrating that we maintain the structural integrity.

MEMBER STETKAR: I wish you hadn't pointed to that. I had a question on PCCS.

MR. WACHOWIAK: Okay.

MEMBER STETKAR: The acceptance criteria for PCCS require that same pressure. You have to verify that it maintains integrity up to -- containment design pressure, that's the way it's written.

MR. WACHOWIAK: Right.

MEMBER STETKAR: This is kind of a PRA question trying to understand a little bit how the PRA works. Does the PRA take credit for the PCCS that's higher than design containment pressure?

MR. WACHOWIAK: Yes.

MEMBER STETKAR: But there's no way to verify that it operates at higher than design pressure through the ITAAC anyway?

MR. WACHOWIAK: That's a conundrum that

we have in this because in order to do that test you would have to put the plant -- it would possibly be considered destructive test. Because it takes --

MEMBER STETKAR: Well, you could probably get a better way to hydro the PCCS line in the heat --

MR. WACHOWIAK: Right. But we're counting in the PRA --

MEMBER STETKAR: You're not pumping up the containment.

MR. WACHOWIAK: Without pumping. Definitely you wouldn't want to pump up containment. But once again we're counting on the PCCS to operate in a regime that is outside of the code. And so, for example, we count on the reactor pressure vessel to maintain its integrity in severe accident conditions at a higher pressure than what the code requires. And we don't test the pressure vessel to those things because we'd end up introducing more problems than it would be testing --

MEMBER STETKAR: No, I just wanted to -- I was just a little curious about that.

MR. WACHOWIAK: And you have to consider that. One of the things that we look at is performing any of these tests going to do something

to damage the equipment in the plant. And we can't do that.

MEMBER STETKAR: Yes. Like I say, you're can have a hard time with your code case after you pump the PCCS up to --

MR. WACHOWIAK: Yes. The next one.

MEMBER STETKAR: It's just you're the same with -- appropriate pressure. You put down number 8 right?

MR. WACHOWIAK: Yes.

MEMBER STETKAR: I mean, is that the maintain pressure for some period of time?

MR. WACHOWIAK: Yes.

MEMBER STETKAR: Is that in here?

MR. WACHOWIAK: I'm trying to remember where that test is. The leakage test, there is a leakage requirement and I don't remember which ITAAC that specifically is.

MEMBER STETKAR: It's not into the containment system?

MEMBER BLEY: It's 7, isn't it.

MR. WACHOWIAK: That says Appendix J. So I'm pretty sure that that's it then.

MS. CAMPBELL: That's it. Yes.

MR. WACHOWIAK: I didn't search for that

particular question beforehand.

Yes, the Appendix J program defines what the acceptable containment leakage is. And so you have that test --

MEMBER STETKAR: I missed that when I was going through.

MEMBER SIEBER: Can you make an attempt to identify where in this criteria --

MR. WACHOWIAK: Yes. You identify where it is and then --

CHAIRMAN CORRADINI: I'm doing a time check. You have ten minutes.

MR. WACHOWIAK: We started ten minutes late. We have 20.

CHAIRMAN CORRADINI: We'll compromise. Fifteen.

MR. WACHOWIAK: So let's move to the next one.

We do have in some cases, not very many, but in some cases we have a table that helps us identify the acceptance criteria. In this particular case we had all of those containment isolation valves. They have a timing associated with them. And we didn't want to put all those specific times in the ITAAC table, so this table is

considered part of the ITAAC table.

And the next one.

This is the I&C ITAAC. And I don't know if in the interest of time if we need to go through these particular ones. Should we just move on.

CHAIRMAN CORRADINI: Move on.

MR. WACHOWIAK: Okay. Nonsafety-based material are the things that are associated with -- they cover more systems than just one.

Go to the next slide.

These are the lists of the places where we have nonsystem-based things. Design and piping, systems and components. It's requirements that are broad based to go across all systems. Software development, human factors engineering. They cover multiple systems.

Go on to the next one.

Here we're going to give some examples of how we did the piping system for -- we'll try to get to this one and get to the 14a stuff, so let's go to the next -- keep going. This is the example of how its presented. And I just have another example on -- go ahead. Next one. Next. And one more. A few more.

The next section here is the interface

material. If there's any specific features of the plant that we took credit for in any of the safety analyses that are not part of the scope of the certified design, this is where we would identify what those features are to be tested.

One of the things that we had that's in Rev. 5 there was only one thing that was identified. It was the capacity of the plant service water system. In the PRA we took credit for the ability of that system to remove heat for seven days without makeup. And so we had to specify that when they designed their system, which is outside the scope of the certified design, it had to have that capability.

And we're in discussion now on the connection to the offsite power and how that needs to be done in the interface.

CHAIRMAN CORRADINI: This is the discussion we had yesterday.

MR. WACHOWIAK: Yes.

Okay. The next page is the site parameters. In the document there's a list of parameters that we use as the envelop for our design analysis. And there are some things that are associated with slow loads and maximum winds and

temperatures and things like that. The assumptions that we made in our various analyses.

There's no ITAAC associated with these in particular. However, every licensee is required to demonstrate that their site fits in the envelop described or defined by the table.

Go on to the next one. As to the example from that, we don't need to go through the example.

And this brings us to things that are back in to the DCD and Tier 2 on the design acceptance criteria closure process.

MS. CAMPBELL: And what we've done in Section 14.3A is talked about a process for closing DAC. And the first part is an introduction. It talks about the regulatory requirements. We'll just skip over that. And then we've really covered the next slide in Eric's presentation yesterday.

When we get to the part where we discuss the three different options to close DAC, our 14.3A really discusses that third one. For the ESBWR based on the way that the schedule works out we'll be closing the DAC through ITAAC after the COL is issued. And then we discussed that process in 14.3A?

MEMBER STETKAR: Where is that in 3A. You've already got five or six pages in 3A.

MS. CAMPBELL: That's discussed in early part of Section 3A.

MEMBER SHACK: 14.3A1

MS. CAMPBELL: Yes, 14.3A. It general-- it focuses on what's in NRC guidance. So all of that's really pulled from NRC guidance. And the NRC identifies that in their regulatory guidance 1.206.

And what happens then after the first ESBWR is that, you know, we'll have the information that was used for the first of a standard group. If we change it later, we'd probably like another version of the ESBWR for DAC purposes. But they would adopt that if they chose to. And that would be under the NRC's concept. It's also described in their guidance. But the one issue, one review, one position.

Next slide.

And so what we've proposed in Section 14.3A is that we would use a topical report process. You know, we're still considering that because it would give us additional finality and subsequent licensees could reference the LTRs.

Does anyone have any questions on that?

Okay. Let's go to the next one.

What we've done in the piping is a little different from the approach that's being used in the earlier certifications. We're going to go all the way through to the code data sheets. And we'll be completely in accordance with ASME code at that point so that the NRC doesn't have to review any interim analyses.

And what we would provide are the ASME code reports. And then after that is closed out, we would have the implementation ITAAC, so we would do a reconciliation of the as-built against those ASME code reports. So that's really a more complete process.

Okay. For digital I&C. We've described the NRC's process that's discussing their guidance where it would be a phased approach. I'll talk about the process, but if you have specific questions about that phased report, I'd like to Steve Kimura.

But basically as each phase s completed we would notify the NRC. And, of course, in the meantime they're going to be aware of all the activities that are ongoing. And they can come in and audit us at any point during that development. But at that point once one phase is completed, and

that would be this life cycle approach that was mentioned yesterday by Mr. Oesterle. But we would at that point say okay, this phase is complete if you want to come in and look at it or if we rolled all those activities into a description in a topical report, then we would notify the NRC at that point that that phase is complete.

And the way the NRC describes that in their guidance is that they would like that opportunity to be back to come in and look at that particular phase and identify if they have any problems before we have completed the next phase. We'd go ahead and move into the next phase, but before we complete it they'd like to get feedback to us. And we would hope that that works out.

Yes, sir?

MEMBER BROWN: There's a statement in here that says on the digital I&C that these subsequent standard ESBR using the standard approach, in other words you've passed the cert first unit, may use the summaries report for design completion elements that were developed to complete the first standard ESBR under the one issue, one review, one position approach. So that in this matter the standard ESBWR plants may be based on the

same set of results and design elements for digital I&C. Now somebody comes along three or four years later, and we talked about this a little bit yesterday, and chip sets will change. But functional design requirements don't necessarily change. The software changes.

I mean my experience has been in about 20 years we went through five different software languages in order to provide software-based computer controlled monitoring, instrumentation, control and protection systems. And each of those, every time you change the software, the language in which its codes, whether it's C, C Plus, CLC what I would call if you really want to get down, it's -- code basic fundamental computer geek stuff where you can use memory -- data goes in it - well, you're telling it everything in order to achieve an end. But all those top level languages, there's been five or six of them, and I can remember when the rage was C and then it was C plus and tomorrow it will be D minus/minus or whatever the heck it might be.

That's tough to say that you can get -- okay, we'll just recode this because nobody -- you can't compile the old code anymore. If the numbers for the software don't maintain their compilers,

then you have to do something different. And as soon as you start compiling differently, you can have different results from the code. That's an actual fact based on real experience.

So I'm not quite sure how to handle this in terms of being able to pass it on to subsequent plants. But I'm sure you all will have some basis for saying it's perfectly okay and you can wave your hands and all that's in the plug and play world, right?

MR. KIMURA: Yes. The development of high quality digital I&C systems really depends on the process. It is less focused on the final results because you can get a box, it can look pretty, it can function nominally as you think it should function and it could be a piece of garbage because they used imprecise ramshackle type development process.

What we describe in Section 3.2 is a software development process that controls both the software and hardware development through the life cycle phases described in --

MEMBER BROWN: In 3.2 of the?

MR. KIMURA: 3.2 of Tier 1.

MEMBER BROWN: Okay.

MR. KIMURA: The life cycle process described in Branch Technical Position 14. 7-14.

CHAIRMAN CORRADINI: But just to interject to move us along, I think I'm sensing that Charlie's question should be directed to the staff because based on what you've read, they're going to have to come up with some interpretation of what they do on the stuff and --

MEMBER BROWN: No, I understand that. But I mean it's in 14.3A which says how we intend this to be executed.

CHAIRMAN CORRADINI: Right.

MEMBER BROWN: That's why I read it, and I agree with really the NRC has to address this. But there's been -- and there are staff positions. There are some other documents that try to talk about this, but yet it's not real clear. And my concern is that software gets redone and then what level of testing is specified. And it's not real clear to me what gets done after that.

CHAIRMAN CORRADINI: All right.

MEMBER BROWN: So I understand what you're talking about.

MR. KIMURA: So the ITAAC for the software development process is divided into really

three parts. The first part is the design acceptance criteria or the DAC part, which actually will encapsulate the requirements that the software has to perform on a system level, which means that if we have to perform certain safety-related functions, we capture that in the requirements.

What happens after the requirements phase is the design phase, the implementation phase, test phase. But you define the languages in the lower phases but you've already captured the requirements of what that software has to do in order to maintain safety of the plant in the requirements phase.

Whether you change the language in the future, you're relying on the process that takes the requirements and translate that into appropriate machine code that then gets loaded into the machine and tested.

MR. WACHOWIAK: So to sum that up, the part you're asking about, the DAC part, which is what 14.3A covers is the requirements part of the software. That could be done once. The change of the compiler would be done under the ITAAC portion, which whether they change the compiler or not needs to be done for every ESBWR.

MR. KIMURA: And then in the ITAAC phase--

MS. CAMPBELL: That would be done on everything.

MR. WACHOWIAK: Every time.

MR. KIMURA: Right. The ITAAC phase will then confirm that, yes, on level 1 we actuate the GDCS injection valve.

MS. CUBBAGE: I'd also just like to clarify. You mentioned 3.2 having a description. That's of course the Tier 1 high level description. Tier 2 Chapter 7 provides additional information and references a couple of -- once the topical reports the staff's reviewing and you'll be hearing about. I think it's going to be planned for the January Subcommittee meeting. So I didn't want you to leave with the impression that the only description is what you're seeing in Tier 1. And that process will be binding for the life of the facility. If they were to install new software, they would have to use that process that the staff's going to review and approve or come in for approval of an alternate process.

MEMBER SIEBER: The industry practice on that is when you buy a machine and it does safety-

related calculations or control functions and so forth, you buy the compiler and all that with it. And you train your staff to be able to operate and maintain that system.

If you decide that you want to change the language, for example, or the method of operation of the control system, that becomes a design change and you go through the entire design change process which ultimately gets documented in the SSAR. And the design has to meet the original criteria. It has to be tested and so forth before its installed and put into service. And there are regulatory requirements for NRC review under certain cases for that occur. But generally speaking the design is frozen once its accepted for the commercial plant and it can't be changed until you go through the entire design change process which has regulatory requirements attached to it.

And over the years I've been involved in those kinds of changes. And the process, if done properly and in accordance with the regulations, are orderly and not disruptive.

MR. KIMURA: The design process that Amy described was in the LTRs. And the LTRs are going to marked Tier 2 star. So that will be fixed and would

require full staff review if the process would ever change.

CHAIRMAN CORRADINI: Are you --

MR. WACHOWIAK: Essentially we're done. The next slide covers the COL information items that we've provided the COL. They're basically the things that we've talked about here before; the emergency planning ITAAC, site-specific ITAAC and then the schedule for the closure of the DAC.

In summary, 14.3 we describe our process for putting together Tier 1. And Tier 1 contains the ITAAC. We're in the middle to late stages of the review from the staff on that. There's a few open items left that Eric will explain and you can decide if "few" is the right term after he's done. But we're in the process of addressing all of those open items and ultimately the document that you see in front of you with some cosmetic changes to make the wording consistent and more legalese, I guess, is coming in Rev. 6. But we had input from the construction inspection folks on how to make it so that their process can more easily and generically close out each of these items. So we've also had feedback not just from the technical staff, but from the inspection staff as well.

MEMBER BLEY: Rick, Dennis Bley. One question back over things you've gone through.

All of the DAC are the items that have design acceptance criteria written in the tables in Tier 1, that's right?

MR. WACHOWIAK: Yes.

MEMBER BLEY: And the DAC is right now in Rev. 5 pretty well complete or is there --

MR. WACHOWIAK: The topics for DAC are pretty well complete. I think we have one extra one that's in there, something in the radiation protection was marked as DAC and wasn't supposed to be. So we've already let the staff know that.

MEMBER BLEY: Okay.

MR. WACHOWIAK: But the topics for DAC are pretty much complete. The exact format of some of the things in the software in the HFE, we're rearranging that based on staff comments. But the topics that are covered under the DAC should be the same.

MEMBER BLEY: Okay. And one specific question on the ITAAC items on EQ. The way I read the acceptance criteria, they're kind of written broadly and that my experience in the past is that acceptance criteria on EQ is one item passes the

physical test. And when I read these they call for following tests, reports the document all of the results and provide something with more than that indication of the ability to survive the environment. So it seems a little more fairer than in the past. Is that true, at least the way you think about it?

MR. WACHOWIAK: I think it's an interpretation of what you're looking at, what the ITAAC needs to do. In the EQ program you're correct. Whatever the configuration of the thing is that you're testing, one thing has to pass.

MEMBER BLEY: Yes.

MR. WACHOWIAK: Then what this ITAAC is then doing is confirming that the as-installed equipment matches the tested configuration. That's what we intend to do with that particular ITAAC.

MS. CAMPBELL: We wrote that so it sets up nicely to just develop what the EQ program will contain only for a operating base.

MEMBER BLEY: Okay. Thank you. I guess I was hoping it went a little further. Because I can read the words that way, but it doesn't. Okay.

MR. WACHOWIAK: No.

CHAIRMAN CORRADINI: Thank you very

much.

The staff will begin their discussion of 14.3 after break. So let's get back here at five of.

(Whereupon, the above-entitled matter went off the record at 10:41 a.m. and resumed at 10:56 a.m.)

CHAIRMAN CORRADINI: Okay. Let's get started.

So I'll turn to Eric to kick us off on the staff's presentation.

Eric.

MR. OESTERLE: Okay. Thank you. Eric Oesterle, NRO staff. Lead Project Manager for Tier 1 on the ESBWR review.

The purpose of this presentation is to brief the Subcommittee on the staff's review of the Tier 1 document and Tier 2 Section 14.3. That review was performed on Rev. 5 of the DCD. We're answer the Subcommittee's questions.

Next slide.

The review of Tier 1 and Section 14.3 really cut across the entire staff. And so I listed the divisions and the technical branches that looked at that Tier 1 and ITAAC. And if you forgot what

any of those acronyms mean or didn't know in the first place, there's a list of them. I'm not going to go through all of them.

All right. So the outline of this presentation, we're going to cover the applicable regulations as far as the status of RAIs. Approximately 440 RAIs were issued on Tier 1 and Section 14.3. About 365 have been resolved.

What I want to point out is that there is a list of open RAIs at the end of the SER with open items. It's a snapshot in time, okay? We are still or have been developing more RAIs and, hopefully, that list includes all of them.

The SER does not discuss all of the open items or RAIs into the text merely because we had to put a freeze on it at some point in time to get it through the lengthy process. If you saw that list of branches earlier in the slide, we had to go through all of those branches for concurrence. So essentially we started in early September in the concurrence process for this.

So there were RAIs that were generated after this document went into the concurrence process and they are being tracked in our database. And some of those we can discuss.

MEMBER STETKAR: Eric?

MR. OESTERLE: Yes.

MEMBER STETKAR: You may have mentioned it, I didn't hear it. The SER that we have, is it linked to a particular revision of the DCD?

MR. OESTERLE: Yes. Rev. 5.

MEMBER STETKAR: Rev. 5?

MR. OESTERLE: Yes.

MEMBER STETKAR: And I was curious about that because there seemed to be some discrepancies, for example in instrument air systems where they changed the design between Rev. 3 and Rev. 4 and yet the SER still talks about those systems as if they're Rev. 3 sort of version systems. And the SER only occasionally and vaguely mentions like the ancillary diesels, which popped up between Rev. 4 and Rev. 5.

So I was curious as I bounced back and forth, it was hard for me to understand where frozen in time this SER is relative to the DCD moving targets.

MR. OESTERLE: All right. Well, that's a good question and let me address it this way: The review of Tier 1 is an interactive process. So it always has to go back to and match any changes

that's been made to the Tier 2 information.

And in terms of timing, if there were changes that were made to Tier 2 as a result of responses to RAIs, 14 and Tier 1 has to kind of catch up. So maybe some of those things you were looking for hasn't caught up. And there are a number of RAIs that were issued after this SER with open items got put into the concurrence process. They're listed in the back. The majority of them are associated with electrical and I&C and HFE, a lot of DAC type stuff.

MEMBER STETKAR: Okay.

MR. OESTERLE: But I just wanted to point that out.

MEMBER STETKAR: Yes. Go on.

MR. OESTERLE: Next slide.

The regulations that pertains to ITAAC for a plant certification is 10 CFR 52.47(b)(1). As I discussed yesterday afternoon, there's a companion regulation, so to speak, in 52.80 with respect to the requirements for a COL applicant and their inclusion of ITAAC and also incorporating by reference the ITAAC that a design certification had.

There is regulatory guidance for applicants, RG 1.206. It's really written for COL

applicants, but it does discuss design acceptance criteria and the various forms of ITAAC for design certification application and COL applications in terms of site-specific ITAAC versus planning ITAAC and for the design features ITAAC.

The review guidance that the staff had for ITAAC has been stated in SRP 14.3. And that is broken in several different sections, and they're all listed there.

And one thing I want to point out is that the way our review guidance is organized is not a system structure and component basis. And so there is not a one-to-one match up with the table of contents in the ESBWR Tier 1 document. So we had to come up with a way to figure out what branches reviewed what sections of Tier 1. And I'll show you that in just a minute.

Briefly want to discuss the review of Tier 2 Section 14.3 that GEH covered this morning. That contains a selection criteria and methodology that the GEH had used to identify what system structures and components from Tier 2 that they wanted to include in Tier 1. And in our review of that section we found that it generally complied with our guidance. There is an open RAI on that

section in which we asked GEH to provide the cross reference tables of key aspects analyses and features of the design for inclusion in ITAAC. And that's discussed in SRP 14.3.

If you've looked at the AP-1000 DCD there are tables. Those are the same kinds of tables that we're looking from GEH. They talked about what key assumptions that were used in the plant flooding analysis or the shutdown analysis or other types of crosscutting analysis.

Also there's a COL action item on DAC closure schedule. An RAI on that which was addressed this morning.

We talked about the no entry ITAAC, we looked at those and found that those systems id not indeed rise to the level of safety significance where we felt that ITAAC needed to be included for those systems.

The initial test program did not require any ITAAC because that program stands on its own. One point I want to point is that for closing out ITAAC, that ITAAC closure process can take credit for portions of or entire procedures that are already part of the initial test program to close out those ITAAC. But they are separate.

MEMBER BROWN: They can or can't?

MR. OESTERLE: Can.

MEMBER BROWN: Okay.

MEMBER SHACK: I heard improperly, too.

MEMBER BLEY: Would you mind commenting on the question that Mr. Stetkar raised this morning if a front line system manages to be worthy of having an ITAAC, why wouldn't the supporting systems that are needed to make it performance functions also be ITAAC?

MR. OESTERLE: Well, it depends on the function that that system performs. And what I can do to try to address that is share with you the guidance that we're looking at in what gets included in ITAAC.

The other thing to remember is that for ITAAC there's a graded approach. So some of these functions may not fall into the upper tier or safety-related function or safety significant function, or risk significant function. And so those support functions may not be required to support those functions that the front line system needs to perform and that also needs a criteria for being included in Tier 1 ITAAC.

MEMBER BLEY: The second one part seems

clear.

MR. OESTERLE: Okay.

MEMBER BLEY: But I think we had an example where one of the functions they said it was in ITAAC for needed -- so your position would be -- well, maybe you're even using sometimes a different criteria than they would. Maybe something they'd put in ITAAC you might not have required to be there. Could that be true?

MR. OESTERLE: What we found was that GEH followed the staff's guidance on what needed to be included in ITAAC. So we're not using any different criteria.

There's an ITAAC an design reliability assurance program which we have an open RAI on. That's a special kind of ITAAC similar to DAC.

And we also looked at the interface materials discussed in Section 14.3 We also have an open item on that with respect to offsite power. We'll discuss that a little bit later.

And 14.3 also contains this section on where it addresses what needs to be done for site parameters.

In general the staff's review of Section 14.3 determined that GEH was generally in compliance

with the staff's guidance.

As I mentioned briefly before, the Tier 1 documents that GEH provided was based on a system organization level. And our SRPs to review that document was not aligned in the same manner. But that wasn't an issue. We just needed to figure out how to get that all reviewed. And I'll show you that matrix in just the next slide.

MEMBER BLEY: Relative to the DAC, you seemed to have moved off of that, but there was a statement in your alls SER on page 4 which said that the applicant chose resolution after COL issuance and its proposed implementation of the DAC ITAAC from the first standard. Does that mean -- there was a resolution, what do you mean by that? It's by an operating license holder?

MR. OESTERLE: Yes.

MEMBER BLEY: The COL holder does all of that?

MR. OESTERLE: Yes.

MEMBER BLEY: And it says it's going to apply for subsequent plants as well. How does staff get involved in that at that level? And it appears it's for all ITAAC -- I'm sorry. For the three DAC area.

MR. OESTERLE: Right. For the three DACs. But the proposal that we reviewed was the one that was discussed this morning by GEH. And that envisioned that closure of DAC would be for the design but they would provide -- closeout DAC would be in the form of a topical report and that we could review that once --

MEMBER BLEY: That's a GEH function, though, not a COL function. A COL doesn't prepare the topical reports, do they?

MR. OESTERLE: At that point it could be-- we haven't resolved that completely yet and we're still working on that. So it's either GEH or the licensee.

MS. CUBBAGE: Regardless of who prepares the documents, it's the COL licensee's responsibility to fulfill that obligation for the ITAAC. So they may be doing it with the support of documents provided by GE-Hitachi, but they're not the licensee.

MR. OESTERLE: It is a proposal that we're still considering. We're working out the details on implementation.

There was no review performed for SERP 14.3.10 because that included emergency planning and

that's provided by the COL applicants not the design cert applicant.

Also the review for statistical security hardware, as Rick indicated this morning, is still ongoing. So that's an open item for this review.

The next slide shows the a portion of the matrix that we developed to determine which branches should review which sections in Tier 1. That table appears as Appendix A in the SER with open items so that you knew exactly which section was reviewed by which branch and in accordance with which SRP section.

CONSULTANT KRESS: Does each branch review each section? For example, you got three branches and three sections and all three of them review all three or does one branch --

MEMBER STETKAR: Or do they split it up?

CONSULTANT KRESS: Do they split it up? How do they work that?

MR. OESTERLE: Each branch is not required to review each and every ITAAC for that system. Only those ITAAC that apply to them and which are governed by the SRP scope.

There is one or two branches that just look at all of the ITAAC, one of them being the

construction and inspection branch. And one of them a nontechnical branch, DNRL.

We did look at all of those ITAAC.

MEMBER BROWN: Is this a complete list or is this just an example?

MR. OESTERLE: That's just an example. The complete list is in the SER.

MEMBER BROWN: That's a sample.

CHAIRMAN CORRADINI: It's in their section --

MEMBER BROWN: Yes, I just now found the thing back in the back.

MR. OESTERLE: Okay. A couple of things that we wanted to point out as lessons learned from previous design certification reviews that we applied on the ESBWR review was that because of the point in the process in which we're reviewing the ESBWR we had the benefit of having several former senior resident inspectors involved who are currently involved in the development of the NRC's ITAAC inspection program and documentation requirements for ITAAC closeout. To be involved in the review of the ESBWR ITAAC. And they had provided a lot of very constructive and beneficial comment in terms of technical comment with respect

to how are you going to close that out from a construction standpoint to format and consistency issues to make sure that there is no misunderstanding or second guessing amongst various inspectors that are looking at different ITAACs and on different systems.

One of the big improvements that was made was in moving away from the basic configuration type of ITAAC that existed early on with the ABWR. If you looked at that basic configuration of ITAAC, it really consisted of five or more separate items including functional arrangement, seismic Category 1 qualifications, ASME code welds, the ASME hydrostatic pressure boundary testing and equipment qualification.

So in terms of being able to inspect closeout of that ITAAC, let alone the capability or the ability of a utility to closeout that one ITAAC, it was much more practical to break that up into several individual components.

We also had a comment to specifically identify those ITAAC which are design acceptance criteria and GEH has done that by annotating the ITAAC items with DAC in the code brackets.

So moving on, the first section of the

SER, I'll had it over to David Chang to talk about SRP 14.3.2.

MR. CHANG: I am David Chang. I belong to the safety engineering branch at NRO. I did cover this SRP Section 14.3.2 Chapter. Particularly we emphasized our review on the safety-related structure such as the reactor building, containment structure, fuel building, auxiliary building and the cell. We went through this mostly, and we did raise some qualifications. And some of the chief issues are in the following.

We got the containment testing. The applicant originally proposed obtaining every test, which is type A testing. But they did not include the type B test. So we will request that the applicant include most type A, B and C tests in the ITAAC for the containment structure.

Another point that we raised was about the containment structure, just a background floor, which separates the wetwell versus suppression pool. And we wanted to clarify what kind of a differntial pressure they are going to pay for, especially because if the pressure is needed and they do not make it clear in their application, so we suggested they make it clear and clearly indicate in the

ITAAC.

And the same issue was raised on the vent walls which are against the -- probably between the wetwell and drywell. And when a LOCA occurs, the pressure pushes through the vent wall into the suppression pool. And the test pressure ought to be that pressure of the containment design.

So these two points were raised in the RAI and the applicant complied.

The next item is pertaining to the propriety of the test pressure. There are some, usually, language which says that the design pressure be above. And we insisted that any difference in test pressure should be specific and clear.

So, for instance, the relationship between the design pressure and the test pressure was 1.15 factor. You have the design pressure 45 psig, but when you test the containment it test to 1.15 of the exam pressure. So we made that clear and they rectified that, the presentation in the ITAAC table, which was an important point.

And then we tried to ensure credit with regarding the statement of the particular code of the table into different ITAAC items. The codes

which are the ASME Section 3 Revision 2 codes for the containment structure and the concrete structure is the Revision 2 for the containment and the ACI 349 for the concrete structure, and ACI for the steel structure.

So these references the codes have been fully clarified and the current ITAAC table provides clear cut information.

Another point that we raised was about the terminology cited. They used some nuclear structure, nuclear island and seismic structure and they came to the conclusion that they're not clearly defined. So we requested that the applicant use a consistent terminology. And the solution was to refer to seismic Category 1 structure to reflect those serious unclear usage of the terminology.

So at this point everything was fully adjusted by the applicant.

MEMBER SHACK: What versions of the code will they be held to? Will that be the design, when the DAC are resolved?

MR. CHANG: For which version of the codes, I think that is the case for the present structure. For instance, in the case of a SRP 384 type of the other Category 1 structure, and we do

refer to N50 1994 with supplement, too. So the SRP provides -- definition of which code, too.

MR. OESTERLE: In fact, this may be an area where this mimics the specific codes.

MR. CHANG: Okay. And the last item I will ask GEH regarding the fuel handling machine aux hoist to what loading they have tested. And they clarified that they're going to take to 1.25 times the design rated.

So all these questions are raised and properly addressed by the applicant. And the bottom line is no open RAIs for Section 14.3.1.2

MS. DIXON-HERRITY: My name is Jennifer Dixon-Herrity. I'm the Chief of Engineering Mechanics Branch Two. The Engineering Mechanics Branch led the review for 14.3.3 dealing with piping system and components.

In doing this review we looked at all of the ITAAC associated with those components and the piping system design and verification. We also were the branch responsible for looking at how the applicant plans to address the piping DAC and completion of the piping design.

Specific to piping DAC, I know that one of the concerns was understanding what the

difference was between how this applicant is dealing or how we dealt with it in this review as compared to past reviews. Similar to past reviews, all of the methodology for the piping design is called out in Section 3 of the DCD.

In this particular application they determined that they were not going to address the design through COL information items. So they have come up with the DAC ITAAC that were discussed earlier today so that the design would be addressed through specific ITAACs for addressing the design. And in addition to that, they have the ITAAC in place that were used previously to address the as-built reconciliation.

In addition to this, in looking at the previous design they didn't really go through and address how the design would be addressed in the future. GEH has provided us with a plan in Chapter 14 on how it can be addressed and a COL information item that provides an opportunity for us to understand the timeline for when it will be addressed. Those have yet to be defined because it would be provided by the COL applicant.

In looking at what RAIs we have, we have a number RAIs. The significant ones that were

opened right now deal with -- well they went through and provided the DAC ITAAC. At first it was nonsystem based. In going through and doing Revision 5 they broke those up so they went from being nonsystem based one set of ITAAC to system based. So you had a collection of piping design ITAAC and component design ITAAC with each of the systems. In doing that, they noted after they submitted it that they had a number of errors and they corrected those errors. We've gone through and looked at that. We identified other errors so we've opened an RAI to have them look again to make sure there are no other corrections that need to be made so that the ITAAC that are in place are similar across the board and address all the concerns that DCIP had previously brought up.

The other significant item that we have open deals with pipe break hazard analysis report ITAAC that's in place. Previously there was a level of detail there that had them back to Section 3.6.2.5 and 3.6.2.5 really defines what is expected to be in the pipe break analysis report. When they went through and they put together the ITAAC that was left out. We have asked them to put that level of detail back in so that we have an understanding

that documents that we'll be reviewing will cover the level of detail called for in 3.6.2.5.

COL action items still available in this section deal with the schedule input that we're looking for from the applicant. They're also looking for the COL applicant to clarify how they intend to complete this.

That's all I had.

MEMBER SHACK: On your previous slide, on that COL item, so the past ones left for the COL to find those DAC, is that what you were saying?

MS. DIXON-HERRITY: The COL applicant will need to define how they're going to provide the piping signs. They can either use the --

MEMBER SHACK: No. It's the next to the last bullet, which would be --

MS. DIXON-HERRITY: In previous designs, for example AP-1000. They had a COL information item in place that had them provide design reports and design specifications for both components and piping. But part of the DAC, part of the design could have been addressed through the COL information item.

In this case we don't have a COL information item. They've taken the COL information

item and made it a design ITAAC. It's determined up front that they're not going to address this during the COL review period, they'll address it during construction.

MR. OESTERLE: All right. The next review section was 14.3.4 reactor systems. And I agreed to go through these slides as long as the staff showed up to rescue me if I got in ice here.

The Reactor Systems Branch reviewed the ITAAC to ensure that important input parameters using transients and actions analyses were verified by the ITAAC. And here's some examples here for you.

Significant systems design features are verified by the ITAAC. The staff reviewed the ITAAC to make sure that was done. And there are some examples there for you as well. And some of those that you have already asked about during these discussions today.

Also fuel and control rods design criteria are designated as Tier 2 star information and can't be change without staff approval. There are some ITAAC on those as well, not as specific as others that we have available.

A couple of these significant open items

that are still under review by the staff and which RAIs have been written for include questions about locations of source arrangements on monitors, power range monitors and neutron sources where they're going to be located in the core and what the impacts on other core parameters may be.

Another open item on ITAAC acceptance criteria for the flow induced vibration testing of the fuel bundles.

We are still waiting for responses from GEH on these RAI.

The next SRP section is 14.3.5 on instrumentation and controls. And Hulbert Li will address those slides.

MR. LI: For Instruction Control Branch, Division of Engineering.

The typical I&C for ESBWR is all over the place. But the safety-related covers the reactor protection system in control in that situation, and how is that monitoring. And then another safety will cover most ever system requiring documentation.

But our emphasis is on the design process of the digital I&C system that covers hardware and software. And the ITAAC area is

Section 3.2 identified as design process and then they identify the ITAAC for every phase of this part.

We also emphasized the IEEE 603 design criteria. IEEE 603 is part of the regulation. So every application has to meet some requirements.

Because some of the detailed designs are not available at certain times, so we use this next process to occur, including the event process and requirements.

For the Tier 1 19 sections involve I&C. And basically tried to determine whether the ITAAC has adequate information for the ratification of design requirements, detailed requirements are discussed in Tier 2. Tier 1, the purpose of Tier 1 is to verify those design requirements are complete. And this process is still ongoing. The next three RAI is just a sample.

For those three we are having discussion with GEH and we will get some agreement, but only waiting for the formal documentation upon request.

The first one is relate to the level of detail. What we want to see is the reactor protection system have some high level, broad diagrams that have some indication showing the new

one.

MEMBER STETKAR: I noticed that RAI is specifically targeted on the RPS. Why wasn't there a similar request for a similar level of detail on things like safeguard evacuation, which is probably much more important in a general sense to overall plant safety?

MR. LI: But this morning the instrumentation, I think it's a little bit contract to show in the -- that amount of time. So they table format.

MEMBER STETKAR: Well, reactor --

MR. LI: Yes. It's a gentleman's call.

The second question is -- was when we reviewed the Revision 5 in Tier 2. They're adding these -- loss of aux feedwater as anticipatory trip, but it's not reflected in the Tier 1. So we asked the question and they are putting in the 2.2.7 Tier 1.

The third question relates to the augmentation of diversity requirements, 2.2.14. And they identify redundant and independent, but never the word diversity, so we bring up that question and they agreed to put in the diversity to one section.

The big area for I&C Tier 1 is

discussing Chapter 7 SER. Summary for the software design process and it's Section 4.18 and we request that Tier 1 provide all specific areas planned. Right now it's kind of just template to how they approach. But for the ESBWR we have two platforms that could be different -- platform has different things. So it has to be clearly identified in the Tier 1 so we can verify when the design's complete to make sure it cover all the requirements.

MEMBER BROWN: What do you mean by two platforms?

MR. LI: For the active trip system they use the NUMAC system.

MEMBER BROWN: Use what? Excuse me?

MR. LI: NUMAC.

MEMBER BROWN: Okay. GE systems?

MR. LI: Yes. And then in the new safety features they use Triconex

MEMBER BROWN: I've heard of that.

MR. LI: Design certification is platform neutral. We just have to have the requirement. But they can put in the specific hardware to satisfy the design requirement.

MEMBER BROWN: I'm still lost? NUMAC is the one you said, right?

MR. LI: Right.

MEMBER BROWN: Did I say that right? Is it NUMAC or NUMAR?

MR. WACHOWIAK: NUMAC.

MR. LI: NUMAC.

MEMBER BROWN: NUMAC, okay. And then the other one was what tronic?

MR. LI: Triconex.

MEMBER BROWN: It's a form of platform, is that --

MS. CUBBAGE: What Hobert was trying to say is that we envision that they're planning to use Triconex but the DCD is actual platform neutral. They're not locked into that platform.

MEMBER BROWN: So you don't want to be--

MS. CUBBAGE: Right. So we speak about Triconex, that's an example of one that they might use.

MEMBER BROWN: So the platform is kind of generic, I mean and it's just a nice word? What does it encompass? Is it an entire system that's already designed? In other words it's a nuclear monitoring system? Is it a control system. Is it a reactor protection system? Does that refer to the stuff inside of the box.

MR. LI: Function or requirement already specified in the DCD. So you have the increment that function all the time and is part of the ITAAC to verify. So how to implement those functional requirements it has to be -- they supply in the hardware software specification documentation. That is in the back closure process. We want a chance to review those documents when they submit the topic on how to implement those.

MEMBER BROWN: Okay. Let me ask this another way.

Is the intent in the DCD then to lay out a set of functional requirements. This is whatever, I guess it's in Tier 2 Chapter 7, is that's where that's going to be?

MR. LI: Right. Yes. Chapter 7 has got the detail functional requirements.

MEMBER BROWN: Okay. But those functional requirements are being developed based on having several different systems already --

MR. KIMURA: This is Kimura, GEH.

MEMBER BROWN: Oh, hi. You're well hidden back there.

MR. KIMURA: I'm hiding behind Sam here.

But we have really several systems that

we're planning to use and our requirement is one of diversity. We didn't want to have the same computing platforms to perform both the reactor protection system function and the engineered safety feature system. So we have a requirement to have diverse computing platforms that implement those function.

The NUMAC system is a GE design that's currently used in existing plants as part of neutron monitoring. They do like the LRPMs and other neutron monitoring function.

That thing is going to be used as the basis for performing the SCRAM function of the reactor protection system.

We have another diverse platform which has been slated to be a Triconex platform, but it as Amy said, the DCD is platform neutral at this point. But it will be diverse, which means that it will have different processor, it will have a different board structure. It will have a different memory structure. It will have a different programming structure than the NUMAC platform.

MS. CUBBAGE: I'd also like to suggest at this time that we're going to come back to you with Chapter 7 in its entirety. So we're really

getting into the details of that chapter.

I think we need to move forward because we don't have much time left. So let's wrap this up.

MEMBER BROWN: You telling me to be quiet?

MS. CUBBAGE: No, but I'm telling you that we'll be able to give you -- you know --

MEMBER BROWN: I was trying to address this on the DAC ITAAC level.

MS. CUBBAGE: Right.

MEMBER BROWN: And when you said two platforms, what I was trying to figure out how were they developing the DAC ITAAC requirements for these platforms.

MS. CUBBAGE: Well when we come back on Chapter 7, we can't talk about Chapter 7 without talking about this again. You know, you can't talk about Chapter 7 without talking about the DAC.

MEMBER BROWN: I agree.

MR. LI: It's still ongoing so we will come back to you with more details.

MR. OESTERLE: I think in summary what we can say is that you have to establish the requirements first to make sure that the platforms fit those requirements.

MEMBER BROWN: No, I understand that. It's just when somebody says they're going to base the design on NUMAC, okay, for this one particular function, the first licensee may not want to use NUMAC.

MR. OESTERLE: Right.

MEMBER BROWN: Isn't that right? He can take some other platform and some other platform for the safeguard system? And the functional requirements back in ITAAC have to be -- really non-platform specific, but whatever. Assuming you talk that out. I wouldn't have thought about that. I would have thought the functional requirements DAC and ITAAC independent, you get platforms, these are what the system has to have for ESBWR. I don't care who makes it.

MR. KIMURA: One of the things that we are doing in Section 3.2 of Tier 1 is to clarify that there will be different plans for the different platform types. And we'll also clarify what the platforms are by various function. So the RPS will be part of a platform. SSLC which also implements the LDIMS and monitoring and ADS and other functions, will be the SSLC/ESS platform. And then that will be clarified so that when we do have DAC

the DAC will clearly show that there'll be separate software plans produced for each of those platforms.

MR. OESTERLE: Thank you, Steven. That really addresses what we've been in discussion with GE on the schedules for resolution of those items.

So if we could move on to the next group of presenters, please.

Looking for Amar, Jean-Claude, Charlie Hinson and Jim Bongarra, and Hanry Wagage. And while they're coming up here, I want to let you know that there had been ongoing discussions between the staff and GEH with respect to digital I&C, a challenging area. We're making progress. We have been down to the Wilmington facility to do an audit and discuss further how to move forward to resolve some of the fuzziness in the digital I&C area.

The next section that we're going to address is the 14.3.6 review on electrical systems. And I would ask the reviewers just to quickly summarize their slides.

MR. PAL: I'm Amar Pal from the safety engineering branch. We looked at the ITAAC for the electrical system based on the SRC 14.3.6. And we have several open items. I'm talking to talk about two significant item, one of them based on the RAI

issued for Chapter 8, 8.2-14 which talks about the effect of the UPS, which is the most important piece of equipment in the ESBWR plan. But it didn't have any mode of operation, it wouldn't have the high voltage -- the high voltage of the UPS.

They responded to that RAI and saw a need for coordination for the objectives and monitor. If they are not coding it properly, we may lose the UPS rectifiers. So, we thought it would be a good idea to have enough ITAAC to verify that coordination is there.

MEMBER STETKAR: A fair transient? What do you mean like a power going away and coming back for milliseconds or something like that?

MR. PAL: Due to the fault and not operation on each operation of protective device. So we're talking about two milliseconds, two cycles.

MEMBER STETKAR: A spike? These are spikes or these are total power variations from normal to zero and back or above, or what?

MR. PAL: No, it's because of the initial operation of this particular device. So it will operate maybe after a while, but it will be there for some time for the few milliseconds. And the UPS system predicts that is measures --

MEMBER STETKAR: So these are voltage transient outside the input band that the UPS for which its designed, is that correct?

MR. PAL: Yes. The other item is the interface requirement for the offsite power system. We found that they did not have this interface requirement for offsite power systems, so we asked that to be included. And we're still working with GE for coming up with some technical requirements for this particular applicant.

MR. OESTERLE: Thanks, Amar.

The next section is on 14.37 plant systems. And I agreed to go through this slide real quickly.

There were no open RAIs regarding plant systems with the exception of a couple of plant protection RAIs submitted on seismic classification, end pipe booster pump and station coverage inside containment. And I think we've received response on one of those.

Our next presenter will be Jean-Claude on rad waste management systems under 14.7.

MR. DEHMEL: Thank you. I'm with the Health Physics Group, NRO.

The work here -- my presentation

integrates the role of balance-of-plant branch, the I&C branch as well as containment ventilation and building ventilation branch.

My review focused on liquid waste management and some of the gaseous waste management and some solid waste management and the process, radiation monitoring system all described in Chapter 11 of the DCD and SRP.

So the focus of my review looked on system that I used to monitor and control liquid effluent releases. It also address some of the requirements that are not associated with safety-related aspects, but that are there to meet specific requirements of Part 20 and Part 50. And then basically the RAI provides design description, functional arrangement basis of acceptance criteria and tests. And try to resolve and reconstruct some inconsistencies between Tier 1 and Tier 2 information.

A total of 16 RAIs were submitted to the applicant.

Next slide, please.

So here the major RAI topics are that were essentially covered.

Confirming the description and

functional arrangements of the system;

Confirming the scope of the test criteria on initiation of valve closure and controlling effluent releases.

Verifying nominal capacity of solid waste management system;

Verifying installation of liners in rooms with adequate waste management system are located, and;

Confirming the initial installation of filtration media in the gaseous waste management.

And all RAIs are closed as of now.

That's what I have.

MR. OESTERLE: Thank you, Jean-Claude.

MR. HINSON: My name is Charlie Hinson. I work in the same branch, Protection Health Physics in NRO.

And I looked primarily at Chapter 12, Tier 2, Chapter 12 Radiation Production. And I looked at the Standard Review Plan 14.3-H radiation protection ITAAC.

The main items I looked at that are covered by ITAAC in this section are the ventilation system with respect to providing containment of airborne radioactive materials and ensuring that

concentrations of airborne radionuclide and maintain the levels consistent with access requirements for the areas were people will be.

Looked at the area radiation monitoring system. This system should continuously monitor gamma radiation levels within the plant based on accessibility and it should have alarms both locally and in the main control room to the level -- in case that radiation level is reached.

I looked at the radiation shielding. The plant design provides radiation shielding from room, corridors and operating areas where personnel would be present. And the shielding should along with the occupancy requirements of those particular areas.

And then the ITAAC the way this was covered the plants are divided into various zones and the occupancy requirements are based on the radiation level of various zones.

And then the fourth area that I looked at just covered by ITAAC is airborne rad activity monitors. And these are provided in those normally occupied areas of the plant where there's a significant potential for airborne contamination.

And, again, these systems are not

safety-related, but the systems are used to ensure compliance with various sections of Part 20 and Part 50.

Okay. I have had six RAIs in this area. Two of them were open. However, I received responses last Thursday on these RAIs, and I'm in the process of looking at these responses. But they look like they're pretty much what may close out the remaining issues I had.

Thank you.

MR. OESTERLE: Thank you, Charlie.

MEMBER SIEBER: I do have a question on this. Part 20 prescribes what kind of doses, whether it's airborne or whether radiation can be given to workers and requirements to minimize that, but it doesn't say anything about where monitors of any type are located. On the other hand, it seems from what you've told us here that you're looking into the details of where the radiation monitoring that's proposed by the applicant, General Electric. What basis do you decide whether that's okay or not?

MR. HINSON: You talking about the area or the airborne? Well, the area monitor --

MEMBER SIEBER: The area and whether it's ionizing radiation or airborne contamination.

MR. HINSON: Okay. The airborne monitors, we make sure that they're able to -- there's sensitivity requirements in the ITAAC based on the limits. And so we make sure that they're able to detect concentrations in all susceptible areas of the plant.

MEMBER SIEBER: They would provide a dose?

MR. HINSON: Right. And if they can't do it with the fixed monitors, then they have to have portable airborne monitoring systems that they will bring in for special function.

And for the area monitors we look at areas that are high radiation zones and areas that have high occupancy. And we have like a list of certain areas that we look at to make sure that these areas, like the fuel handling areas, et cetera, that have airborne and area.

And GE has provided a large number of the area radiation monitors throughout the plant. And we've looked at those locations and feel that they're prudent.

MEMBER SIEBER: Well, let me refine my question. IF the applicant in the design of the plant did not have radiation monitoring in a certain

area, what would be the basis for they have to say you ought to have monitoring here?

MR. HINSON: Well, we've --

MEMBER SIEBER: Here's the whole regulation for whatever says you ought to have it.

MR. HINSON: Okay. If it's an area where you're going to have hibernation, I mean we want to ensure that the people do not exceed the Part 20 limit. And if it's an area that is going to be a high dose area that have frequent occupancy, we base it on Part 20 limits.

I mean, if it's --

MEMBER SIEBER: Yes. I know what Part 20 says. And general good health as a practice would say -- a plant health physicist would say that you need portable instruments for this job, I need fixed instruments --

MR. HINSON: Right.

MEMBER SIEBER: But I don't recall that being in the regulation anyplace. It's a matter of--

MR. HINSON: Well, that's part of the--

MEMBER SIEBER: -- professionalism of the radiation technicians.

MR. HINSON: It's a part of radiation protection to operate, the 12-5 the radiation

protection operating which NEI has come up with as template for it that describes the access and when you place monitors, portable monitors to supplement the area.

MEMBER SIEBER: Is that endorsed by the staff?

MR. HINSON: Yes.

MEMBER SIEBER: Are they a requirement?

MR. HINSON: It's a --

MEMBER SIEBER: Or this is a way to do it?

MR. HINSON: As far as an operating code, that is one of the operating functions. It's endorsed by the staff. Yes, we've been working with NEI for the last few years to come up with the operational aspects. And so, you know, you've got fixed area monitors and then you've got guidance on where there other radiation protection monitors are at to implement portable monitors.

MR. OESTERLE: I think that aspect of the discussion is really dealt with the COL in terms of implementation of the operational programs, the radiation protection program and its governed by a license condition.

MS. CUBBAGE: This is Amy Cubbage. The

intent --

MEMBER SIEBER: I'll drop it at this point so that we can move on.

CHAIRMAN CORRADINI: Good. I think we need to move on.

MEMBER SIEBER: Okay.

MR. OESTERLE: Thank you, Charlie.

The next section of review is human factors engineering. And this has the similar challenges to digital I&C in that it contains DAC. And so, Jim, in the interest of time I'll ask you to just discuss in summary level the RAIs that you have on the next four or five slides.

MR. BONGARRA: I'm Jim Bongarra on the human factors engineering review of the Chapter 18 of the ESBWR review.

We started out with 13 initial RAIs that were rated to the Tier 1 ITAAC in the area of human factors engineering. We have six of them that are essentially still open. And five of the six, and they're all listed here on the list so in case you wanted to look at them in detail. Five of the six are really more clarification related and editorial in nature, administrative in nature.

The first one that's identified here is

a little bit more detailed. I'm sorry, not the first one, but the next slide on --

CHAIRMAN CORRADINI: Which slide? Minimum inventory.

MR. BONGARRA: It is the first one. Pardon me. 14.3.4.36. And the bottom line to this one it's really going back to the discussion that was had earlier this morning with the Subcommittee in terms of safety-related versus nonsafety-related. And we're kind of in the same territory here. We want to make sure that the human factors engineering program is not just focused on safety-related human system error basis, but it encompasses essentially a wider inventory. So that's really what we're trying to get across here in this RAI that we've asked. It's still an open issue.

I might just mention one thing real quick, and that is to say that on these six RAIs that we have remaining in human factors aren't necessarily the only of the six that be remaining. Because we, as Charlie just mentioned, just received a response from GEH in the past that relates to Tier 2 material. And we have a great deal of effort left to do here, over 300 pages of information that has been submitted to us to address several of the Tier

2 level RAIs.

So from that review of the remaining Tier 2 material there may be some additional RAIs that we may identify that relate to Tier 1.

Unless the Committee has questions, I'll turn this over then to the next presenter.

MEMBER STETKAR: Is there any attempt, and this is part of ITAAC, to try to quantify an acceptance criteria relative to the volume of critical data necessary for the operators to manage the plant versus less critical data? And I ask that question relative to I guess you have to go back to TMI when one of the complaints, and it was in the Commission report, was that the operators were constantly deluged with alarms for the elevator not working. I mean very unimportant nonrelevant types. I don't know whether that's an ITAAC or whatever it is. But somewhere do we address the stuff that the operators have to look at and what does he need to really control, protect, shutdown, take action if necessary if he sees something. You won't think about that at all as part of this ITAAC process? And I'm sure you do, but -- I wasn't trying to say you don't. I apologize for that.

MR. BONGARRA: Let me just mention two

things quickly. There is an alarm prioritization team that not just GEH has come up with, but it's a strategy essentially that used as a result of the issue with TMI where essentially alarms are segregated, prioritized by their importance and their effect on different safety systems. So that's one aspect that's essentially come from the TMI event.

The second thing is is that we have embedded technically within the overall human system error based inventory what's the minimum inventory of alarms, controls and displays. And this is an area that we're working with GEH on and the industry as well in a large scheme.

The minimum inventory of alarms, controls and displays is aimed at identifying those alarms, controls and displays that are necessary essentially to safely shutdown the plant in case of a loss of all digital systems and maintain the plant in a safe shutdown condition. And there are specific attributes, characteristics if you will that apply to not only the development of those human system interfaces, the alarms, controls or displays but to determine their location, their accessibility to the operators so that they can

immediately take the necessary actions that are required.

So hopefully that addresses --

MEMBER STETKAR: Well, that addresses part of it. I mean -- because there's other key parameters. You use the words "display," so I presume that would include such things as the operator primarily being in his view, stuff like the reactor power, pressure, temperature; those items, the particular ones that are critical to know where he is relative to his operating band and/or some display format that allows him to see something is getting out of bounds fairly easily. So that was the only purpose of the comment is does that roll into your alls process and is there an acceptance criteria protocol for when you say okay, here's the final thing we're looking at. When somebody builds a plant that they're going to adhere to the protocol that you all feel is satisfactory. So that was the purpose of my question.

I just want to -- does it go up and down or this way or whatever. You gave me plenty of answers.

MEMBER SIEBER: But let me add something to your question and give some explanation.

CHAIRMAN CORRADINI: We're getting to the end and I want to make sure we have time for comments from all the members.

MEMBER SIEBER: The TMI action plan, one of the action items was to require a safety parameter display system.

MR. BONGARRA: I remember that clearly.

MEMBER SIEBER: It was separate from the regular control system. And it displayed six categories of high level signals in a human factored way so that an operator could tell from that display when he was getting out of bounds in a certain area.

As far as I know, SPDS systems are still required, even in the ESBWR. And the independence requirements so that John and I are behind on acquiring data on prioritization is already built into that system. And so far that's been good enough. I presume that's what you're requiring the staff, the staff is requiring, compliance with--

MR. BONGARRA: SPDS function is they're still requiring it for design certification.

MEMBER BROWN: Yes. But the first ones I saw were a kind of a box or something that just a guy looked at and the spots moved outside the box and there's just something --

MR. OESTERLE: We need people so we need that.

MEMBER BROWN: Yes. I'll stop right here.

MR. OESTERLE: We'll move on to the last remaining section of the containment system.

MEMBER SHACK: Question for Jim. Why?

A couple of these open items you have you're asking GEH what do you mean by things will be delayed until later in human factors engineering. Are there aspects of the HFE you think maybe should be more complete at this time? Is that where those are pushing or just for clarification.

MR. OESTERLE: The short answer to that is?

MR. BONGARRA: The short answer to that is yes, there are.

DR. WALLIS: No, they're not.

MR. OESTERLE: Let's go back to the final category --

DR. WALLIS: This is the section in which I have some question. I know you want to get us to lunch.

CHAIRMAN CORRADINI: I want to get us done.

DR. WALLIS: This is the only section in which I have serious questions. These four areas. I'm just warning you ahead of time. Maybe you can cut me off. I just want to --

CHAIRMAN CORRADINI: I probably will. But ask them anyway.

DR. WALLIS: Let's go. I think containment is a rather important area to investigate?

CHAIRMAN CORRADINI: I agree.

MR. WAGAGE: My name is Hanry Wagage. I'm from Containment and Ventilation Branch to Division of Systems Safety and which actually is part of NRO.

Our main focus was to verify the systems accredited for containment analyses. This slide shows the RAIs we issued to access some of these persons. All of these RAIs correspond to these added ITAAC. I think because of the time concern I'll go to the last item. The last item was--

DR. WALLIS: Can I talk about the debris issue. The debris issue.

MR. WAGAGE: Yes.

DR. WALLIS: You seemed to have closed the debris issue?

MR. WAGAGE: No. The debris issue is not closed in this --

DR. WALLIS: So it's closed?

MR. WAGAGE: No.

DR. WALLIS: Just the important information is closed?

MR. WAGAGE: Important information I define given in the --

DR. WALLIS: Well, I read your report. It said that GE had not supplied information on their analysis. And you've closed it simply on a promise on GEH to supply analysis assumptions. I would think it would matter what those assumptions are and how complete the response is before you closed that issue.

MR. BONGARRA: I identified the onset that GEH is going to verify some features which minimize debris generation. For example, water GDCS have stainless steel liner.

DR. WALLIS: It's a big issue. I don't understand how you close an issue just on a promise to supply information. You've got to see the information itself.

MR. WAGAGE: We have not closed the debris issue. We closed this item only that this

item is specifically identified here. The one is that stainless steel liners in GDCS pool and --

DR. WALLIS: Okay. So leave that.

Now how does this effect in ITAAC? I mean what do you do about these strainers? Do you just look at them and see that they're manufactured as designed? Is that the only thing that they do in the ITAAC?

CHAIRMAN CORRADINI: Are you trying to tie this back to the generic issue?

DR. WALLIS: Well, no. The debris on strainers is an issue that we have written on. It's important.

CHAIRMAN CORRADINI: Right.

DR. WALLIS: And as far as I can make out you accept GE's promise to analysis, but what on earth do you inspect or test or do in the ITAAC process to these strainers? Do you just look at them?

MS. CUBBAGE: There are two issues that we're looking at. In Chapter 6 Henri's looking at the design of the strainers. And that's an open issue. There's additional work that needs to be done. GE has to respond. We have to review that to ensure that they've factored in the appropriate

design considerations.

And then your second question about the ITAAC verifications that are appropriate for this discussion, and I believe this RAI was closed because GE has committed to verify the features that Henri was --

DR. WALLIS: What are the features? Just look at it? What is it you look for when you an ITAAC on a strainer? Do you look for the spacing or something? All you can do, it seems to me, without a test is to simply see its made as designed. That's all you can do.

MEMBER STETKAR: And is the design to the staff.

DR. WALLIS: Yes.

MS. CUBBAGE: We have to determine the design is acceptable before we can certify it.

DR. WALLIS: What's different --

MS. CUBBAGE: There are two issues. And then they have to verify when they built the plant that they have installed --

DR. WALLIS: Installed as designed.

MS. CUBBAGE: Exactly.

DR. WALLIS: That's all I wanted to know.

MR. WAGAGE: The last item I have here is the Committee raised an issue with --

DR. WALLIS: Okay. Now PCCS, I don't understand how you're going to verify that it removes 11 megawatts.

MR. WAGAGE: PCCS has the capacity of 11 megawatts and is supposed to be working at 45 psi --

DR. WALLIS: We11, it's designed for steam at a pressure of 48. Are you going to test it with a team --

MR. WAGAGE: No, no.

DR. WALLIS: So what are you going to do in the ITAAC process?

MR. WAGAGE: They are going to analyze, there will be analysts' reports verifying these --

DR. WALLIS: But that's the design itself.

MR. WAGAGE: This involves analysis, too.

CHAIRMAN CORRADINI: But I think, if I might just break in, Graham, I think you're linking it back but in this case the functional -- there's no way to functionally test it without putting it in the containment. So they're going to verify that it's built as it should be and therefore based on

that in connecting back to analysis of past test of their separate effects that it is as it should -- that's the only thing I can imagine they would do.

MR. SNODDERLY: This is Mike Snodderly from the staff. That's exactly what we're going to do. We have assure ourselves that the PCCS that is installed can be tied back to the test program. And they're going to be looking at for inlet diameters. But what I think Graham has identified is what I'll a risk is that in lacking specific -- there's two ways to attack this problem.

One was to put very specific aspects of the PCCS design. The other was to reference back to the test. So that gives more latitude to inspectors. They'll be looking at the test report and all aspects of the test report. But the point is that you need to verify. You need the PCCS installed. Could remove 11 megawatts active graded--

DR. WALLIS: The way it's written in the SER is the focus of ITAAC is intended to do a verification of numeric performance values.

MR. SNODDERLY: That's right.

DR. WALLIS: Not the way its made, but the way it works.

MR. SNODDERLY: You have the numeric

performance measures, right? Based on this is a test program that was conducted by GEH that showed--

DR. WALLIS: That's not a test. That's not an ITAAC, is it --

MR. SNODDERLY: Okay. But that's the test -- so you're going have to -- we're going to have link and assure ourselves that the PCCS installed can be -- it is sufficiently similar to the one that was part of the test program.

DR. WALLIS: That it be the same, yes. So there's no real ITAAC. You're just checking that it's built the way that it was tested.

MR. SNODDERLY: Yes.

DR. WALLIS: That's all.

MS. CUBBAGE: No. At the certification stage --

DR. WALLIS: There's all kinds of other stuff here you say you're going to check, but you're not going to check.

MR. OESTERLE: Some cases they're going to test function, some cases they can -- they can't test function and they will test -- they will do analysis.

DR. WALLIS: See, it's not written that way. That's very confusing.

MS. CUBBAGE: And we're not about to leave any test for later to confirm that this design is an acceptable design. That all has to be done before certification so that's why they did the PANDA test, et cetera, et cetera to support certification.

DR. WALLIS: Well, let's move on.

CHAIRMAN CORRADINI: Are you done?

DR. WALLIS: I'm not done with my questions.

CHAIRMAN CORRADINI: Well why don't you go ahead because I think they're done.

DR. WALLIS: Did you have another slide? I had a question on the next slide.

MR. WAGAGE: Oh, excuse me. Go to next slide.

DR. WALLIS: This bypass leakage test there. I'm completely unclear about how that-- and it's a difficult test to really do. Very unclear about how that's going to be done.

MR. WAGAGE: Yes.

DR. WALLIS: But then there's another thing you say here is that there's going to be some sort of measurement of whether or not its open. Right? Whether or not the vacuum breaker is open.

And you complained that GE had a measurement of whether it was fully opened. That wasn't good enough. They need to have a proximity sensor to tell if its open. Well, what is open? Open can be anything from a tiny little thing to an enormous. What do you mean by a proximity sensor which says that its open?

MR. WAGAGE: Open, mean that its going to have leaking more than the design leakage. That's what --

DR. WALLIS: It doesn't say that. So it's going to measure if its open or not to have a leakage? The opening which gives the leakage more than the design leakage is very tiny.

MR. WAGAGE: Breakers are designed to have a leakage capacity of 0.02 centimeters --

DR. WALLIS: Very small. Very small.

MR. WAGAGE: By open means it's open to give more than the leakage capacity. That's what needs to be identified.

CHAIRMAN CORRADINI: But if I might defer this. We haven't seen the last of the vacuum breakers.

DR. WALLIS: No.

CHAIRMAN CORRADINI: So I would say

we're going to see this again.

DR. WALLIS: I'm sure we're going to see this again. We're going to see all this again.

CHAIRMAN CORRADINI: That's an open item that we've yet to even close and --

DR. WALLIS: I think the problem is the ITAAC review it seems to be so superficial such important parameters, so I don't understand how it contributes anything to assuring me that this is going to work. That was my -- maybe I'm completely wrong. It's just in reading the documents I get that impression.

MR. OESTERLE: We appreciate the comments, Dr. Wallis. And I think the best way to address this is that the first thing we have to do is convince the Committee of the Tier 2 material and that there's adequate basis. And really this is the way this is supposed to work. And then we talk about the subset of the important parameters that we're going to verify and how we're gong to verify them. And in this stage --

CHAIRMAN CORRADINI: And we're still in the process of being convinced of the Tier 2.

DR. WALLIS: As a matter of fact a gap in relation to these.

CHAIRMAN CORRADINI: Right.

So I'm going to thank the staff. And in the interest of time, go around the group. I've already lost someone of the Committee. So I'm going to turn to Graham and we want to go around and get summary comment briefly. And I will try to capture all of it between Harold and I.

I just want to go around for everybody.

DR. WALLIS: Well Dr. Kress said that he agreed with everything I'm going to say.

CHAIRMAN CORRADINI: Okay. Good.

DR. WALLIS: I think I've said it already. I mean, I can understand that you want to verify very, very carefully that things are put together the way they're designed. And if you can check that they will work as designed, you do. But there are a lot of these sort of safety systems where you can't check that they work. You have to go back to the tests. And it's really mysterious to me what is actually going to be checked and what is actually going to measured about some of these safety systems, which is going to give a contribution to assuring that they will work. And I'm not quite sure what that is because it seems to be just open a valve and water comes out or

something. That's not much of a check.

So until I know the tests, until I know how they're going to be interpreted and what they're asking, I can't really tell if they're going to tell me anything useful. That's the biggest question I have.

CHAIRMAN CORRADINI: I got it.

DR. WALLIS: And the rest of it, I understand that there's process which is somewhat opaque to the uninitiated observer, though I have some faith that its actually being carried out appropriately.

CHAIRMAN CORRADINI: And Dr. Kress agrees with you? I wrote that down.

Charlie?

MEMBER BROWN: One edit list of open items and it terminates at 14.3, status 435 is an open RAI, 14.3.438 is listed as open in your presentation.

So I don't know, maybe it's closed. But the two lists don't add up.

The other point is just what I talked about earlier, it's still not clear to me. I'm still nervous about the closeout process, you know the ITAAC, how it gets into the integrated test plan.

We've already been through that. Don't need to milk it.

I have a little disagreement with the claim that it's outside scope. But not disagreement, I'm comfortable with the statement that that is outside of the scope of the design cert which was pointed up to by staff. And I'm not criticizing it. I'm just not comfortable with that at this particular point.

So that's it for me.

CHAIRMAN CORRADINI: Stetkar briefly.

MEMBER STETKAR: I think the only thing that's a take away is that I'd like to understand a bit better the process that was used to make decisions about what specific systems and functions are included in ITAAC, what are excluded and why the ones that are excluded are excluded. And maybe an open item on that, I don't want to go into detail. I'll just stop there.

CHAIRMAN CORRADINI: Is that your support system point?

MEMBER STETKAR: No, it's just in general. I'll leave it in general.

CHAIRMAN CORRADINI: Yes, what I wrote down, because I figured John was going to say this,

it criteria for graded approach and what system structures or components are included and what level do they stop at and why.

MEMBER STETKAR: There are examples in the SER and GEH documents that say things like -- it's clear everything is safety-related in there, but we used the PRA, we used decisions about RTNSS, we used these decisions but we made graded decisions, but we made this kind of decision. But nowhere does it explain what decisions were made and why they were made. Why is something in one column in one column and something else in another column.

CHAIRMAN CORRADINI: Dennis?

MEMBER SHACK: It's related to John's -- you know, completeness is always the issue here. You know, we have the ITAAC, obviously. They describe the system. You know, deciding whether you've got enough description is always the sort of difficult point.

I did go back and look at the AP-1000. The cross reference table would be very helpful I think in answering John's question and maybe making the rest of us fell better about the completeness issue that you've really highlighted the features that you need to identify.

CHAIRMAN CORRADINI: And it is an open issue.

MEMBER SHACK: We want to make sure there is an open item.

MEMBER ARMIJO: I just think that it's unfortunate that we're reviewing this section kind of out of sequence. We haven't reviewed the detail design well enough to be comfortable that the design will work. So a lot of the questions that come up I just base the fact that we're doing this thing, in my opinion, out of sequence.

For example on piping I don't think there's any issues on piping that the Committee has. It's instruction and control of these kind of things that either the design isn't mature enough or we haven't reviewed it in sufficient detail that we come to all these issues.

So I think it's just a symptom of the way we're doing this piecemeal review.

MS. CUBBAGE: I want to acknowledge what you're saying. And just so you understand that we did put some thought in that and this was to be the last of the SER with open items chapter. We had some difficulties with Chapter 7 that have caused it to be deferred. But this is the SE with open items,

this is the tailend of it.

MEMBER ARMIJO: Yes.

MS. CUBBAGE: And we tried to put this last. So I understand your concern.

MEMBER BLEY: I especially agree with what John and Bill said. And, of course, this comment here.

The thing that's been pestering me all through this and yesterday helped a whole lot is how this process really works. And I'm happier than I have been.

The DAC area is the part that I'm still struggling with here. And I guess one part of it that I asked a lot about yesterday I've rationalized now. And it just seems to me that if great care is taken in defining these acceptance criteria some of the issues maybe get better. And I found one real simple example just that I'll mention to say why that seems it may be better than I thought it was.

There's one ITAAC here for feedwater isolation valve, it talks about the test. But the acceptance criteria is a report that documents that the valves close upon command. Now when the DAC comes through under control system there are other control systems that control this valve and the

review raises some issues. Those issues could be a refinement of what it takes to meet that acceptance criteria. And I think that you legitimately picked up pretty well. So that makes me a little happier.

When I go back and read the original documents about where the DAC came from, it's really as everybody said that it was those things were supposed to be acceptance criteria, very objective, measurable, testable. The thing I just read it's kind of that way, but it's going to take more significantly to do, and even at the end of that document it points out that because of this process, you can open up a hearing right prior to the end.

The thing that bothers me, the way the DAC's working those DAC issues -- I'm real comfortable with the rest of the testing and ITAAC being setup the way it is and the reasons following what the licensee does. But on DAC because that's part of the basic design that's getting verified not until that late point, I don't see why we're not involved and I don't see anything in the rule --

CHAIRMAN CORRADINI: I was waiting for you to say something about that.

MEMBER BLEY: I just can't see how we avoid looking at that. That's where I end up.

CHAIRMAN CORRADINI: Well, let's hold that thought because I --

MEMBER BLEY: And it's not just for ESBWR. It's a general issue.

CHAIRMAN CORRADINI: I agree. It's a generic issue. Yes.

MEMBER SIEBER: Okay. I'll be real short.

CHAIRMAN CORRADINI: Good.

MEMBER SIEBER: But I think it's difficult for engineers to deal with high level documents like we've been doing for the last couple of days. Because we all want to know all the details. And the details aren't in the high level documents and we're relying on another level of staff management and licensee management, and the vendor to fill in those details.

The only question that I have is that we are relying on the safety of this plant based on analyses that's been performed by GEH, by the prototype testing to confirm the portions of analysis that may have some question involved, construction testing just to make sure that water comes out the end of the pipe, preop testing which says that it's important the way you're supposed to,

startup testing which involves itself with the reactor and how it functions and all of that.

It's not totally clear to me that every aspect of the safety of the plant is covered by one of these facets. I presume -- I would hope that somebody has done that someplace along the line. You know, we're seeing in the high level document a lot of detail. But the ultimate question for us is is everything covered.

So that would be my only --

CHAIRMAN CORRADINI: Let me end off, because the last two comments I guess that you guys just had, I've detected a theme. And I guess I'd put the theme like this, which is I think we're going to have to live it. But I can tell that people aren't happy about it, which is with the DAC as -- and so it's not -- and I guess I'm expressing what I thought I heard but summarizing.

I think in 14.2, since there is a 14.1, in 14.2 I have no problem. If anything, I think this is a bit stronger than the current legal requirement or 10 CFR 50. But in 14.3 what I hear is that we, the group we, are uncomfortable because: (a) we might not be or are not -- will not be involved, so that gets us all nervous. And (2) I'm sensing, and

I could be wrong about this, I kind of want to understand how the headquarters staff that is doing the design certification is going to fold into the inspection relative to the DAC in the region that's going to do this. Because it seems to me you're now worried about certain things and you're -- I'll use the word "worry," but you are focused and involved in certain things and that's going to be a passoff. And since some of these things are to be designed from an ITAAC and within the ITAAC process that's what I sense your concern is.

Your concern is that we're not in it, but I want to make sure those that are cognizant of certification are heavily involved in the inspection, testing, analysis part.

MEMBER BROWN: Yes. That's pretty good and pretty close. And I guess the one thing when I read the original language about DAC, it's talking about limited. You know, it should be limited. When you have something like this whole control system and power and it's very limited. That's run the whole machine.

CHAIRMAN CORRADINI: That brings up a generic question that Charles brought up. I've written it down. It's not for these guys, but it's

what I wrote down was the generic question is: Do we agree with the need for DAC going forward for rapidly changing topics such as piping, ESIC and human factor?

So that's a question that was brought up. But I think as a group we've got to discuss it. Because that's where it comes down.

MEMBER BROWN: And this came out at a time rapidly moving forward with saying between now and six or ten years off when the plant's going to be here. Plants are coming.

CHAIRMAN CORRADINI: Right. Okay.

MEMBER SIEBER: Maybe I'll add one last comment.

CHAIRMAN CORRADINI: Briefly.

MEMBER SIEBER: I've been through three construction, startups and operating processes, three different plants. And I would say that this concept of regulation is better than the old Part 50 concept as far as defining what everybody says to do.

I'm not as nervous as I might appear to be.

CHAIRMAN CORRADINI: You look very nervous. I know that you have to leave.

Thank you all.

Adjourned.

(Whereupon, at 12:27 p.m. the meeting was adjourned.)

CERTIFICATE

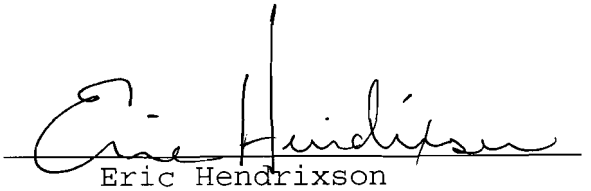
This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on Reactor Safeguards

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.



Eric Hendrixson
Official Reporter
Neal R. Gross & Co., Inc.

Presentation to the ACRS Subcommittee

ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Presented by NRO

October 21, 2008

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Purpose

- Brief the Subcommittee on the staff's review of ESBWR DCD, Revision 5, Tier 2, Section 14.3, and Tier 1
- Answer Subcommittee's questions
- Tier 2, Section 14.3: Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)
- Tier 1: Design Descriptions and ITAAC, Non-System Based Material, Interface Material, Site Parameters

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Review Team:

- Lead PM
  - Eric Oesterle (DNRL)
- Technical Reviews

  DE: SEB2, CIB2, ICE2, EMB2, EEB

  DSRA: SRSB, SBPB, SBCV, SFPT, SPLB

  DSER: RSAC, RHEB, RGS,

  DCIP: CHPB, COLP, CCIB*

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Division of Engineering (DE):

SEB2 = Structural Engineering Branch
CIB2 = Component Integrity, Performance & Testing Branch
ICE2 = Instrumentation, Controls and Electrical Branch
EMB2 = Engineering Mechanics Branch
EEB = Electrical Engineering Branch

Division of Safety System & Risk Assessment (DSRA):

SRSB = Reactor Systems, Nuclear Performance & Code Review Branch
SBPB = Balance of Plant Branch
SBCV = Containment & Ventilation Branch
SFPT = Fire Protection Team
SPLB = PRA Licensing, Ops Support & Maintenance Branch

Division of Site & Environmental Engineering (DSER):

RSAC = Siting & Accident Consequences Branch
RHEB = Hydrological Engineering Branch
RGS = Geoscience & Geotechnical Branch

Division of Construction Inspection & Operational Programs (DCIP):

CHPB = Health Physics Branch
COLP = Operator Licensing & Human Performance Branch
CCIB = Construction Inspection & Allegation Branch

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Outline of Presentation

- Applicable Regulations
- RAI status - 437 RAIs issued/364 resolved
- Significant Open Items
- Staff review of Tier 2, Section 14.3
- Staff review of Tier 1
- Discussion / Committee questions

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Regulations:

- 10 CFR 52.47(b)(1) - requires inclusion of ITAAC in an application for design certification

Review Guidance:

SRP 14.3: Inspections, Tests, Analyses, and Acceptance Criteria

- SRP 14.3.2, Structural and Systems Engineering
- SRP 14.3.3, Piping Systems and Components
- SRP 14.3.4, Reactor Systems
- SRP 14.3.5, Instrumentation and Controls
- SRP 14.3.6, Electrical Systems
- SRP 14.3.7, Plant Systems
- SRP 14.3.8, Radiation Protection
- SRP 14.3.9, Human Factors Engineering
- SRP 14.3.10, Emergency Planning
- SRP 14.3.11, Containment Systems
- SRP 14.3.12, Physical Security Hardware

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Review of Tier 2, Section 14.3:

- Selection criteria and methodology determined to be consistent with guidance in SRP 14.3 - **RAI 14.3-405** issued to provide cross-reference tables of key aspects, analyses, and features of the design for inclusion in ITAAC
- COL Action Item on DAC closure schedule
- "No Entry" ITAAC
- ITAAC for Initial Test Program - NR
- ITAAC for Design Reliability Assurance Program - **RAI 14.3-437** issued for clarification
- Interface materials - PSWS and offsite power - **RAI 14.3-394**
- Site parameters

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Review of Tier 1:

- Organization of Tier 1 information was not in alignment with SRP - resulted in development of "Review Responsibility Matrix" - (Appendix A to SER 14.3 w/OI)

- No review performed for SRP 14.3.10, Emergency Planning: EP - ITAAC not provided in DC application as this is COLA specific

- Review for SRP 14.3.12, Physical Security Hardware, is on-going

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

ITAAC Section	DCD Tier 1 Section Title	SRP Section	Branch(es)
2.1.1	Reactor Pressure Vessel System	14.3.2 14.3.4	CIB2, EMB
2.1.2	Nuclear Boiler System	14.3.3 14.3.4	EMB, CIB2, SRSB
2.2.1	Rod Control and Information System	14.3.5	ICE2
2.2.2	Control Rod Drive System	14.3.3 14.3.4 14.3.5	SRSB, CIB2, EMB
2.2.3	Feedwater Control System	14.3.4 14.3.5	ICE2
2.2.4	Standby Liquid Control System	14.3.3 14.3.4 14.3.5	SRSB, EMB, CIB2

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Review of Tier 1:

- Examples of lessons learned from previous DC reviews

  - review by former Senior Resident Inspectors involved in development of the NRC's ITAAC inspection program and documentation requirements for ITAAC closeout (NEI working group)

  - format and consistency (e.g., ASME Code)

  - "basic configuration" ITAAC (ABWR design) uncoupled to result in individual ITAAC entries for verifications of functional arrangement, welding, seismic qualification, environmental qualification, MOV functions

  - identification of individual ITAAC entries that constituted design acceptance criteria {DAC}

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.2, Structural and Systems Engineering:

- Issued ITAAC RAIs Related to:
  - Cont. Type B and C Press. Tests
  - Diaphragm Floor/Vent Wall Diff Press Test
  - Cont. Design and Test Pressures (45 psi vs 1.15xDesign Press.)
  - Compliance to ASME Sec III Div 2, ANSI/AISC N690, SRP 3.7/3.8 Requirements
  - Definition of Nuclear island/Seismic Struc.
  - Load Test of Fuel Handling Machine Aux. Hoist

No open RAIs for 14.3.2

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.3, Piping Systems and Components:

- Review of the ITAAC relative to design and verification of piping and components.

- Review of the approach for addressing the piping design.

Piping DAC:

- Piping and support design and analysis methods are defined in DCD Section 3 similar to previous applications.

- As opposed to including a COL Information Item, piping DAC ITAAC define design commitment, inspection, testing, analysis (ITA), and Acceptance Criteria (AC).

- COL information item will provide NRC staff with information on the applicants plan to address piping DAC.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.3, Piping Systems and Components:

Open RAIs:

- **RAI 14.3-414** requested GEH to correct the errors identified by staff, as well as other errors may exist in Section 2
- **RAI 14.3-131 S02** requested that the ITAAC be modified to request the Pipe Break Analysis Report as defined in DCD Section 3.6.2.5.

COL Action Items:

- COL Info Item 14.3A-1-1 - Establish a Schedule for Design Acceptance Criteria ITAAC Closure
- Each COL Applicant identify whether the standard DCD approach will be used and provide a Design Acceptance Criteria ITAAC closure schedule in the COL application.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.4, Reactor Systems:

- Important input parameters used in transient and accident analyses are verified by ITAAC (e.g., pressure loss coefficients for steam separator, fuel bundle, etc., and ICS minimum drainable liquid volume
- Significant systems design features are verified by ITAAC (e.g., GDCS pool elevation related to GDCS injection to RPV, CRD scram time, and SRV capacity)
- Fuel and Control Rods design criteria are designated as Tier 2* and hence cannot be changed without staff approval

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.4, Reactor Systems (cont'd):

- Significant open items

  - **RAI 14.3-397** on location of SRNMs, LPRMs, neutron sources and spare sources in the core

  - **RAI 14.3-398** on ITAAC acceptance criteria for FIV testing of fuel bundles

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.5, Instrumentation and Controls:

- I&C systems involving reactor protection and control, ESF actuation, and other systems using I&C equipment
- Design process of digital I&C systems (hardware & software)
- Emphasis on IEEE-603 design criteria
- Using design acceptance criteria (DAC) to make safety determination when detailed design is not available due to rapidly change in technology such as in digital I&C area (per SECY-92-053)

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.5, Instrumentation and Controls (cont'd):

- 19 Tier 1 sections were reviewed to determine the adequacy of the ITAAC for verification of the design requirements. Following are some of remaining open items:
  - **RAI 14.3-259** related to level of detail
  - **RAI 14.3-403** related to documentation of an anticipatory trip in ITAAC
  - **RAI 14.3-404** related to documentation of diversity requirement in ITAAC

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.5, Instrumentation and Controls (cont'd):

The following items are addressed in Ch. 7 SER w/OI:

- **RAI 14.3-418:** No DAC/ITAAC items are explicitly established for the specific project plans and no ITAAC closure activities are clearly described
- **RAI 14.3-265:** Tier 1 Section 2.2.15, Table 2.2.15-1 has not identified certain IEEE-603 criterion that should be in DAC/ITAAC verification process
- The staff has held discussion with the applicant on schedule/plan for resolution based on the established RAI response schedule

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.6, Electrical Systems:

Significant Open Items

RAI 14.3-413: In response to RAI 8.2-14 regarding the effects of voltage spike on the electrical distribution system components after loss of the electrical grid during islanding, GEH stated that fast transients on the alternating current input to the UPS input rectifiers and battery chargers can result in high direct current voltages and if the rectifiers and inverter trips are not coordinated, subsequent inverter trips and loss of power to the safety-related loads can occur. Since trip coordination of battery chargers and UPS under excessive ac input voltage conditions during islanding mode, an ITAAC is necessary to verify the trip coordination of safety-related battery chargers and UPS input rectifiers with inverters.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.6, Electrical Systems (cont'd):

RAI 14.3-394: DCD Tier 1, Section 4, "Interface Material," states that an applicant for a COL that references the ESBWR certified design must provide design features or characteristics that comply with the interface requirements for the plant design and ITAAC for the site-specific portion of the facility design, in accordance with 10 CFR 52.79(c). However, the applicant identified no interface requirements for the offsite power system in the certified design.

As indicated in DCD Section 8.1.5.2.4, the ESBWR standard design complies with the requirements of GDC 17 with respect to two independent and separate offsite power sources. Therefore, the NRC staff requires an ITAAC to verify that the required circuits from the transmission network satisfy the requirements of GDC 17 with regard to its capacity and capability, regardless of its low risk significance in the ESBWR design. The applicant should revise DCD Tier 1, Section 4, to include interface requirements for the offsite power system.

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ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.7, Plant Systems:

- 24 Fire protection RAI's submitted – 2 Remain Open
  - **RAI 14.3-395** on seismic classification of the standpipe booster pump
  - **RAI 14.3-396** on hose station coverage requirement to include all areas containing equipment important to safety

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.7, Plant Systems –Radwaste Management (1):

- Review focused on systems used to control and monitor liquid and gaseous effluent releases
- RAI focused on non-safety related systems but used to comply with Part 20 and Part 50, Appendix I
- RAIs addressed design descriptions, functional arrangements, basis of acceptance criteria and tests, and Tier 1 and Tier 2 technical inconsistencies
- 16 RAIs submitted on radwaste management systems and associated effluent radiation monitoring system

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.7, Plant Systems –Radwaste Management (2):

- Major RAI topics:
  - Confirming descriptions and functional arrangements
  - Confirming test criteria on initiation of valve closures in controlling effluent releases
  - Verifying nominal capacities of SWMS equipment
  - Verifying installation of steel liners in rooms where LWMS equipment are located
  - Confirming initial installation of absorbent and filtration media in GWMS/OGS and LWMS equipment
- All RAIs are closed

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.8, Radiation Protection:

Review focused on the radiation protection aspects of the design, including the following:

- Ventilation system provides containment of airborne radioactive materials and ensures that concentrations of airborne radio-nuclides are maintained at levels consistent with personnel access needs
- Area radiation monitoring system continuously monitors gamma radiation levels within the plant and alarms (both locally and in the MCR) when preset radiation levels are reached
- Plant design provides radiation shielding for rooms, corridors, and operating areas commensurate with their occupancy requirements
- Airborne radioactivity monitoring is provided for those normally occupied areas of the plant in which there exists a significant potential for airborne contamination (issue still open and action underway to resolve)

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.8, Radiation Protection (cont'd):

- 6 RAIs submitted on shielding and radiation monitoring systems (2 RAIs remain open)

Significant Open Item

- **RAI 14.3-174:** Provide an ITAAC for those airborne radioactivity monitors which are used to monitor airborne radioactivity levels for those normally occupied areas of the plant in which there exists a significant potential for airborne contamination

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.9, Human Factors Engineering:

- **RAI 14.3-436:** Revise DCD Tier 1, Rev. 5 to remove the limitation or apparent limitation to only safety-related items.

  DCD, Rev. 5, Tier 1, Section 3.3 states that "The ITAAC for the Human Factors Engineering process address the ESBWR safety-related systems described in Table 2.2.10-1 and their associated safety-related functions." Table 2.2.10-1 is titled "Systems and Functions Comprising the Q-DCIS." Each of the HFE element ITAAC items in Table 3.3-1 has had a similar statement added in Rev. 5 of Tier 1 that was not in Rev. 4. This apparent limitation of the HFE ITAAC to safety-related items from Table 2.2.10-1 is not appropriate and does not agree with the scope of HFE defined in the DCD Tier 2, Chapter 18, in the Tier 2* HFE implementation plans, and in regulatory guidance (SRP Chap. 18 & NUREG-0711).

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.9, Human Factors Engineering (cont'd):

- **RAI 14.3-421:** Explain relationship of minimum inventory paragraph on p 3.3-1 to context of the information preceding and following the paragraph.

  Please explain why, on page 3.3-1, of Tier 1 of DCD Rev 5, sections discussing "applicable facilities, HSIs, procedures, training," etc., were removed from the Design Description. Please also explain why the paragraph for minimum inventory was inserted as it was; is it meant to be a "Program Goal?" Is it an "HFE design goal?" The paragraph appears simply to have been inserted with an ambiguous relationship to the previous and subsequent material on page 3.3-1 and 3.3-2.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.9, Human Factors Engineering (cont'd):

- **RAI 14.3-422:** Explain relationship of item listing on p 3.3-2 to context of the information preceding and following the list.

  Page 3.3-2, of Tier 1 of DCD Rev 5, lists 11 items, beginning with "operating experience review" and ending with (on page 3.3-3), "the strategy for the Human Performance Monitoring process…" Please explain how this list relates to the previous and subsequent paragraphs.

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.9, Human Factors Engineering (cont'd):

- **RAI 14.3-423:** Clarify meaning of details of the HFE design will not be completed by design certification.

  Page 3.3-3 of Tier 1 of the DCD Rev 5: please clarify the meaning of, "… details of the HFE design will not be completed before the NRC issuance of a design certification." Specifically, what is meant by "details of the HFE design?" Are the details those items identified in the acceptance criteria column of Table 3.3-1, e.g., "The scope of the OER" is a "detail" that will not be completed before design certification?

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.9, Human Factors Engineering (cont'd):

- **RAI 14.3-211:** ITAAC Table 3.3 1 contains 11 items, one for each element of NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, issued February 2004, and the corresponding ESBWR element implementation plan. However, the design commitment column in ITAAC for each element refers to the overall man-machine interface system and the HFE Implementation Plan rather than to the specific implementation plans of the pertinent elements. The staff requested that the applicant update the 11 design descriptions provided in Tier 1 to refer to the applicable implementation plans. The applicant responded in a letter dated May 15, 2008, stating that, "GEH will revise the design commitment column in ITAAC Table 3.3 1 in DCD Tier 1, Revision 5, ...to reference the respective implementation plans." The staff is continuing to evaluate the GEH response of May 15, 2008. Therefore, RAI 14-211 is being tracked as an open item.

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SRP 14.3.9, Human Factors Engineering (cont'd):

- **RAI 14.3-271:** In this RAI, the staff requested the applicant to update the ITA and AC columns in Table 3.3 1 to ensure that they accurately reflect the methodology described in the final versions of the implementation plans, following revisions to address the staff's concerns identified in Chapter 18 of the SER. In addition, the staff asked the applicant to review all of the items in the AC column to ensure that the text is complete. For example, in Table 3.3 1, Item 1, the AC states, "Summary report documents that:

a. The OER team members and backgrounds.
b. The scope of the OER.
c. The sources of the operating experience reviewed and documented results.
d. The process for issue analysis, tracking and review."

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ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.11, Containment Systems:

Significant Closed Items

- Information important for addressing containment debris issue (**RAI 14.3-230**)
- PCCS design parameters (**RAI 14.3-238**)
- PCCS vent line submersion (**RAI 14.3-240**)
- PCCS to GDCS piping should be designed to minimize the possibility of forming gas pockets (**RAI 6.2-181**) (ACRS question)

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

SRP 14.3.11, Containment Systems (cont'd):

Significant Open Items

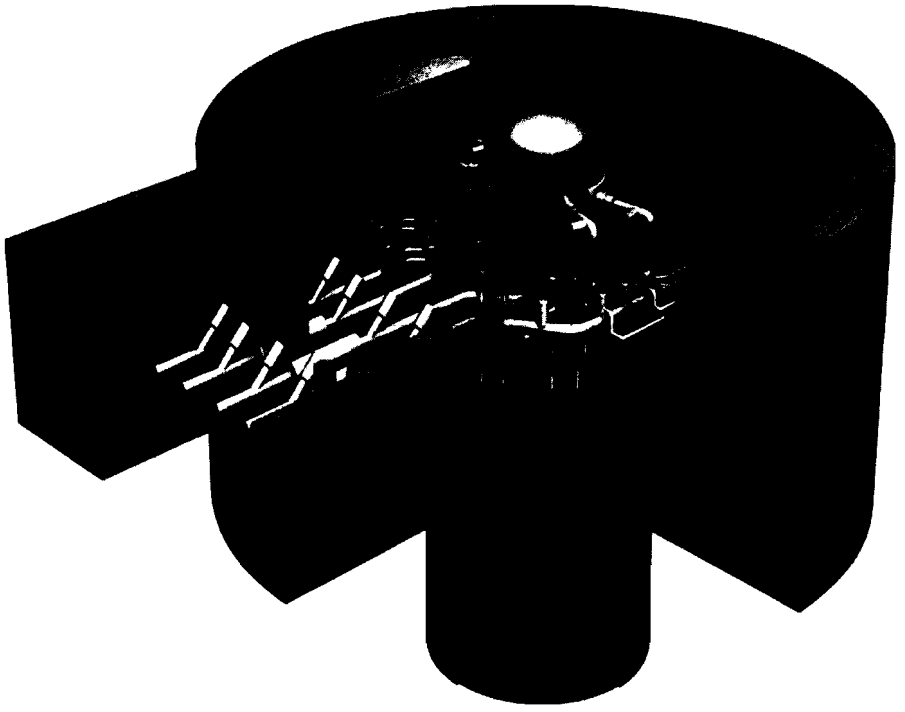
- Suppression pool bypass leakage testing:
  - Test acceptance criteria (**RAI 14.3-229**, which is linked to RAI 6.2-145)
  - Test pressure (**RAI 14.3-438**)
- Schedule/plan for resolution

ACRS Subcommittee Presentation
ESBWR Design Certification Review
Tier 2, Section 14.3, and Tier 1

Discussion/Committee Questions

ESBWR DCD Tier 2 Section 14.3 and Tier 1, Inspections, Tests, Analyses and Acceptance Criteria

Advisory Committee on Reactor Safeguards



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October 22, 2008
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Presentation Content

- DCD Tier 2 Section 14.3 and Tier 1
  - > Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)
  - > 14.3A, Design Acceptance Criteria ITAAC Closure Process
- COL Information
- Summary

Section 14.3 - Overview

- Section 14.3 provides selection criteria and processes used to develop Tier 1 information and ITAAC
- Tier 1 information provides design bases and design characteristics that are certified by the 10 CFR Part 52 rulemaking process
  - > Types of information and level of detail in Tier 1 are based on a graded approach commensurate with the safety significance of the structures, systems, and components

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Overall ITAAC For A Facility

- The entire set of ITAAC for each facility consists of the following four parts:
  - > Design Certification ITAAC (Tier 1 ITAAC)
  - > Physical Security Hardware ITAAC
  - > Emergency Planning ITAAC
  - > Site-specific ITAAC

Section 14.3 – Tier 1 Section 1

- Tier 1 Section 1 – Introduction
  - > Defines terms used in Tier 1
  - > General Provisions
  - > Figure Legends

Section 14.3 – Tier 1 Section 2

- Tier 1 Section 2 – Design Description and ITAAC
  - > Contains design description and ITAAC material for individual ESBWR systems, and includes an entry for every system
  - > Design Descriptions address the top-level design features and performance standards that pertain to safety of the plant
    - – descriptive text (focusing on ITAAC)
    - – supporting figures

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Key Selection Criteria – Design Description

- Selection criteria reflects the Commission directive in Statement of Consideration for Part 52
- Safety-related features and functions of SSCs
- Some nonsafety-related SSCs are discussed in Tier 1 design descriptions only to the extent they perform safety significant functions or have features to prevent a significant adverse effect upon the safety-related functions of other SSCs
- Focus on physical characteristics of the facility that will be verified by ITAAC
  - > Configuration and performance characteristics that the SSCs will have after construction is complete
  - > Fixed design features expected to be in place for the lifetime of the facility

Design Description

- Tier 1 utilizes system-by-system report structure
- The following information (as applicable) is provided in design description entries:
  - > System name and scope
  - > System purpose
  - > System safety-related modes of operation
  - > System classification (i,e., seismic category, ASME code)
  - > System location
  - > Functional arrangement
  - > Types of electrical power
  - > Electrical independence and physical separation
  - > Other features or functions significant to safety or important for meeting certain NRC regulations

Graded Treatment in Tier 1

System Type	Scope of Design Description and ITAAC Design Commitment
Safety-related systems that contribute to plant performance during design basis events (e.g., emergency core cooling systems).	Design features and performance characteristics.
Nonsafety-related systems involved in special events (e.g., station blackout).	Design features and performance characteristics affecting the safety of the plant's response to the event(s).
Nonsafety-related systems with no relationship to safety or any influence on overall plant design.	No discussion except identification of the system title.

ITAAC

- Define activities that confirm the plant as constructed conforms to design features and characteristics defined in the Design Description
- Provided in Tables with the following three-column format:
  - >Design Commitment
  - >Inspections, Tests, Analyses
  - >Acceptance Criteria
- Must be completed and the acceptance criteria satisfied prior to fuel load

Key Selection Methodology - ITAAC

- Selected most direct method for verification
  - >Inspection
  - >Test
  - >Analysis
- Where testing is specified, appropriate conditions for the test will be established in accordance with Initial Test Program (ITP)
- Conversion or extrapolation of test results from test conditions to design condition may be necessary to satisfy certain ITAAC

Key Definitions for ITAAC

ITA Approach	Application
Inspection	**To be used when verification can be accomplished by visual observation, physical examinations, review of records based on visual observations or physical examinations that compare the as-built structure, system or component condition to one or more Tier 1 design description commitments.**
Test	**To be used when verification can be accomplished by the actuation or operation or established of specified conditions, to evaluate the performance or integrity of the as-built structures, system or components. The type of tests identified in the ITAAC tables are not limited to in-situ testing of the completed facility but also include (as appropriate) other activities such as factory testing, special test facility programs, and laboratory testing.**
Analysis	**To be used when verification can be accomplished by calculation, mathematical computation or engineering or technical evaluations of the as-built structures, systems or components. (In this case, engineering or technical evaluations could include, but are not limited to, comparisons with operating experience or design of similar structures, systems or components.)**

Section 14.3 – Tier 1, Section 3

- Tier 1, Section 3 – Non-System Based Material
  - > Includes Tier 1 design descriptions and their associated ITAAC for design and construction activities that are applicable to more than one system

Non-System Based Material

- Design of Piping Systems and Components
- Software Development
- Human Factors Engineering
- Radiation Protection
- Initial Test Program
- Design Reliability Assurance Program
- Post Accident Monitoring Instrumentation
- Qualification of Mechanical and Electrical Equipment

Design of Piping Systems and Components

- Piping design section of Tier 1 defines the processes by which ESBWR piping is designed and evaluated
- Includes ITAAC for consequential effects of pipe rupture such as jet impingement, potential missile generation, pressure/temperature effects

Qualification of Mechanical and Electrical Equipment

- Includes electrical and mechanical components in a harsh environment
- Includes safety-related digital I&C in mild environment
- Addresses methods for identifying environmental conditions and methods for testing, type testing, and analyses

Tier 1 Section 4 – Interface Material

- Interface requirements may apply to:
  - >Systems entirely outside the scope of the design certification
  - >Out-of-scope portions of those systems that are only partially within the scope of the design certification
- Site specific ITAAC design features implement the interface requirements; therefore, Tier 1 does not include ITAAC for interface requirements

Tier 1 Section 5 – Site Parameters

- Represent envelope of bounding site conditions for any license application referencing the ESBWR design certification
  - >No ITAAC included and section limited to defining ESBWR site parameters
  - >Compliance with site parameters are verified as part of issuance of a COL

Section 14.3A–Design Acceptance Criteria ITAAC Closure Process

- General ITAAC closure process is set forth in NRC regulations (i.e., 10 CFR 52.99)
- 10 CFR 52.99 (a) requires licensee to submit an initial schedule for completing ITAAC and then to submit periodic updates throughout the construction phase
  - > The initial schedule within one year of issuance of the COL, or at the start of construction, which ever is later
  - > Schedule updates are submitted every 6 months thereafter up to one year prior to the scheduled fuel loading date when the licensee the submits the updates every 30 days

Section 14.3A–Design Acceptance Criteria ITAAC Closure Process (Cont.)

- Design Acceptance Criteria are a special type of ITAAC and consist of a set of prescribed limits, parameters, procedures, and attributes upon which the NRC may rely in making a a final safety determination to support a design certification (ref: SECY 92-053)
- ESBWR includes Design Acceptance Criteria for:
  - > Piping
  - > Digital Instrumentation and Controls (I&C)
  - > Human Factors Engineering (HFE)

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Section 14.3A–Design Acceptance Criteria ITAAC Closure Process (Cont.)

- There are typically three options to close Design Acceptance Criteria ITAAC:
  - > Resolution through amendment of a design certification rule
  - > Resolution through the COL application review process
  - > Resolution through Design Acceptance Criteria ITAAC after COL issuance
- The third option would be implemented for the first standard ESBWR plant and initially reviewed, inspected or audited by the NRC for closure
- Treatment in subsequent standard ESBWR plants may be based on initial closure of Design Acceptance Criteria ITAAC under the concept of "one issue, one review, one position"

Section 14.3A–Design Acceptance Criteria ITAAC Closure Process (Cont.)

- GEH may submit Licensing Topical Reports (LTRs) supporting Design Acceptance Criteria ITAAC closure
  - > Subsequent licensees could reference the LTRs and NRC closure documents for Design Acceptance Criteria ITAAC closure unless the design certification rule has been amended to reflect the design information
  - > Each COL Applicant will provide a Design Acceptance Criteria ITAAC closure schedule in COL application and identify whether the standard approach will be used

Section 14.3A–Design Acceptance Criteria ITAAC Closure Process (Cont.)

- Design Acceptance Criteria ITAAC for Piping Design
  - > Consists of both Piping/Piping Component Analysis and the Pipe Break Analysis for safety-related ASME Code piping
    - – Identified in separate Design Acceptance Criteria ITAAC
    - – ASME Code prescribes certain procedures and requirements that are to be followed for completing the piping design
    - – Reconciliation of the applicable safety-related as-built piping systems is covered in an as-built ITAAC to demonstrate that as-built piping reflects the design, as reconciled

Section 14.3A–Design Acceptance Criteria ITAAC Closure Process (Cont.)

- Design Acceptance Criteria ITAAC for Digital I&C
  - > Phased Design Acceptance Criteria ITAAC closure process for the digital I&C design
    - – RG 1.206, Section C.III.5 describes a phased Design Acceptance ITAAC process for digital I&C
    - – The ESBWR digital I&C Design Acceptance Criteria ITAAC identify the process and requirements necessary to develop the design information and acceptance criteria for various stages of design and subsequent construction and testing
    - – The COL licensee should develop procedures and test programs necessary to demonstrate the the Design Acceptance Criteria ITAAC requirements are met at each phase

Section 14.3A–Design Acceptance Criteria ITAAC Closure Process (Cont.)

- Design Acceptance Criteria ITAAC for HFE
  - > Phased Design Acceptance Criteria ITAAC closure process for HFE
    - – RG 1.206, Section C.III.5 describes a phased Design Acceptance ITAAC process for HFE
    - – The ESBWR Tier 1 Design Description and Design Acceptance Criteria ITAAC delineate the process and requirements to develop the design information required in each area of HFE, as described in NRC NUREG-0711, "Human Factor Engineering Program Review Model"
    - – HFE implementation plans are reviewed as part of the design certification review and are designated as Tier 2* information

COL Information

- 14.3-1-A Emergency Planning ITAAC
  - > The COL Applicant shall provide Emergency Planning ITAAC, based on industry guidance
- 14.3-2-A Site Specific ITAAC
  - > The COL Applicant shall provide Site Specific ITAAC for systems not evaluated in the DCD
- 14.3A-1-1 Establish a Schedule for Design Acceptance Criteria ITAAC Closure
  - > Each COL Applicant will provide a Design Acceptance Criteria ITAAC closure schedule in the COL Application an identify whether the standard approach will be used

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Summary

- DCD Tier 2 Section 14.3 provides accepted approach for development of Tier 1 information and inspections, tests, analyses, and acceptance criteria (ITAAC)
  - > Section 14.3A depicts the closure process for Design Acceptance Criteria ITAAC items
- DCD Tier 1 ITAAC provide design bases and design characteristics of the ESBWR
- GEH is currently addressing remaining Open Items