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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE

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OPEN SESSION

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WEDNESDAY

SEPTEMBER 7, 2011

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

JOHN D. SIEBER, Chairman

SAID ABDEL-KHALIK, Member

J. SAM ARMIJO, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR., Member

JOY REMPE, Member

MICHAEL T. RYAN, Member

JOHN W. STETKAR, Member

NRC STAFF PRESENT:

CHRISTINA ANTONESCU, Designated Federal Official

JOHN BURKE, RES/DE

MICHAEL CASE, RES/DE

CLIFF DOUTT, NRR/DLR

GURCHURAN SINGH MATHARU, NRR/DE/EEEB*

ROY MATHEW, NRR/DE

MATTHEW McCONNELL, NRR/DE/EEEB

KENN MILLER, RES/DE/MEEB

DARRELL MURDOCK, NRR/DE

SHEILA RAY, RES/DE

GERALD WAIG, NRR/DIRS/ITSB

GEORGE WILSON, NRR/DE

ALSO PRESENT:

THOMAS KOSHY, NRC Consultant*

MICHAEL VILLARAN, Brookhaven National Laboratory

*Participating via telephone

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

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

1:28 p.m.

CHAIRMAN SIEBER: The meeting will now come to order. This is a meeting of the Regulatory Policies and Practices Subcommittee and I am John Sieber, Chairman of the Subcommittee for this meeting.

ACRs members in attendance are Charles Brown, Dennis Bley, John Stetkar, myself, Sam Armijo, Said Abdel-Khalik (who is Chairman of the full committee), and Joy Rempe. We may have Mike Ryan here also later on but right now he's not here.

Christina Antonescu of the ACRS staff is the designated federal official for this meeting.

During this meeting the staff will discuss the draft final Regulatory Guide RG 1.93, "Availability of Electric Power Sources." And Reg Guide 1.218, "Condition Monitoring Techniques for Electric Cables Used in Nuclear Power Plants."

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

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

Register on August 23, 2011.

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

Mr. Tom Koshy, a former member of the RES staff, will be participating by the bridge line as an RES staff consultant. The purpose of Mr. Koshy's presence by bridge line is to answer questions that the committee may pose.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register Notice. Therefore, we request that participants in this meeting use the microphones located throughout the meeting room when addressing the subcommittee. The participants should first identify themselves and speak with sufficient clarity and volume so that they may be readily heard.

Now we will proceed with the meeting. I call upon Mr. John Burke, Acting Branch Chief, the Mechanical and Electrical Engineering Branch of the Division of Engineering in the Office of Research to provide some introductory remarks.

John.

MR. BURKE: Thank you.

Mike, do you have anything you want to

say?

MR. CASE: Sure. I'm Mike Case. I'm the Director of the Division of Engineering in the Office of Research. We're often asked by the program offices to develop the Reg Guides to sort of support them in their program. We are going to talk about a couple of them today. I just wanted to offer a few items of context.

First, I want to express a little bit of appreciation to the ACRS because part of my responsibilities is the Reg Guide Update Program. You probably know it's a commission-directed program and there's about 450 Reg Guides in the NRC Library of Reg Guides. So we've been moving through those through the years so we're down to less than 200 of them to go.

As you probably know, every one of those Reg Guides involves at least one interaction with the ACRS. I've been doing this for a couple of years and I'm really proud to say that the ACRS has never been a scheduler impediment to get the Reg Guides done so we really appreciate that from a program perspective that the ACRS contributes as much as it does in that area.

What else? A lot of these Reg Guides are

important but not urgent and so, once again, it's to the ACRS' credit that they can take the time and effort that it takes to take some of these things that aren't urgent.

They are not like COLs. They're not like license renewal application. They're not like design certification reviews. Get them on your schedule and get us feedback on these Reg Guides. I think it's important. I appreciate that the ACRs does that.

Second, I want to make you aware of what I call special circumstances with these two particular Reg Guides. Our presenters today are not really the primary authors of these Reg Guides.

The primary author of these Reg Guides were two other members of our staff. They were Tom Koshy and Satish Agrawal. Between them they probably had about half a century of experience in nuclear power plant operations and electrical issues.

Fortunately, just this last month Satish retired and Tom went on assignment over to IAEA and he'll return in about three years as an NRC employee. That's why we have Tom on the phone to sort of supply maybe some of the background information.

Because of that I ask for your forbearance with our young and talented junior staff, but our real

mission is to get you the information that you need to make a decision on these Reg Guides. We do have a lot of support here from program offices and other folks involved in these Reg Guides.

Then finally I just want to talk a little bit about Sheila's Reg Guide. It's somewhat of an interesting one. If you look at Rev. 0 of this Reg Guide you'll find out it's probably issued in 1974 so that makes it about 36 years between revisions so it's been a long time. That was one of the challenges with this Reg Guide.

When you read it if you are familiar with the Tech Specs you'll sort of recognize that it has a lot of links to the action stations in the Tech Specs. Most of our regulatory history is really tied up in Standard Tech Specs and not in this particular reg guide.

One of the challenges for this reg guide is to sort of write it consistent with a lot of the regulatory history that has occurred in Standard Tech Specs. That is one thing that you'll see in this reg guide.

The second, we had a significant operating experience event that occurred. That was the Northeast blackout. The staff issued a Generic Letter

as a result of that so it also incorporates that experience.

The third thing that it does is something that we actually learned from the ACRS. It at least talks about future plants so it talks about passive designs. That was the other item that I think was important in this particular reg guide.

So as far as what we're looking for as an outcome for this particular meeting, we're looking to supply you enough information at the subcommittee level so that you will be able to write a letter. I'm thinking something sort of like the letters from Ed Hackett back to Bill Borchardt that says that he has no objections to the staff plans to issue this reg guide as a final reg guide.

With that I'll turn it back to Sheila.

MS. RAY: Thank you. As Mike mentioned, my name is Sheila Ray and I'm here to talk to you about Reg Guide 1.93, the availability of electric power sources.

Next slide, please. Slide 2. Reg Guide 1.93 Rev. 0 was issued in December of 1974. The LCO actions and completion times were incorporated into the Standard Tech Specs.

This Reg Guide was revised for a number of

reasons: First, to incorporate the lessons learned from the 2003 Northeast blackout and Generic Letter 2006-02 on "Grid reliability." Furthermore, this Reg Guide addresses the impact of deregulation and also includes information on passive and evolutionary designs.

Next slide. The Northeast blackout occurred on August 14, 2003, and impacted the Northeastern United States and parts of Canada. Nine Nuclear Power Plants tripped and power was restored anywhere from one to six-and-a-half hours.

The emergency diesel generators functioned per design basis to maintain safe shutdown conditions. Thus, the Northeast blackout was significant in terms of the number of plants affected and the duration of the power outage.

Next slide.

MEMBER STETKAR: Sheila, how long was power off at Browns Ferry from the tornados?

MS. RAY: From the tornados? I am not sure. I would have to get back to you on that.

MEMBER STETKAR: About four days.

MS. RAY: Thank you.

MEMBER STETKAR: How long was power off at Turkey Point because of -- I've forgotten the

hurricane name.

PARTICIPANT: Andrew.

MR. BURKE: Almost seven days.

MEMBER ABDEL-KHALIK: Seven days.

MEMBER STETKAR: You're right.

MR. BURKE: And at Waterford three for Katrina it was about three-and-a-half days.

MEMBER STETKAR: Okay. Thanks.

MR. MATHEW: Let me give you some more background. What we found from our studies regarding the loss of offsite power. Clearly lost of power -- restoration takes longer than previously assumed so that's some of the change we are looking at, different rules. We're looking at 50.63 station blackout, part of that.

MEMBER STETKAR: I'll let you get through your background.

MS. RAY: Okay.

MEMBER STETKAR: I want to kind of ask a fundamental question before you get into some of the details of the Reg Guide.

MS. RAY: Okay.

MEMBER STETKAR: But get through the background information first.

MS. RAY: All right. Slide 4.

CHAIRMAN SIEBER: Let me interrupt just to check to see that the bridge line is actually working. Is Tom Koshy on the bridge line?

MEMBER STETKAR: Is anyone out there?

MR. MATHEW: They might be muted on their side.

CHAIRMAN SIEBER: Well, we'll check on that. Why don't we go ahead.

MS. RAY: Okay. Slide 4. In February 2006 the staff issued Generic Letter 2006-02 as a result of issues identified in the Northeast blackout.

Next slide, slide 5. Generic Letter 2006-02 discussed several issues. First, the use of grid studies by the transmission system operator to assist nuclear power plants in monitoring grid conditions for offsite power operability.

Also included information on communication between the grid operator and the nuclear power plant to be aware of situations that could result in inadequate voltage or a loss of offsite power.

Secondly, Generic Letter 2006-02 included information to consider grid conditions in maintenance risk assessments and monitoring the grid during maintenance activities.

Lastly, the Generic Letter included

information to identify offsite power sources and transmission paths for offsite power restoration.

Next slide, slide 6. Reg Guide 1.93 discusses the staff's position on acceptable restrictions if the available power sources are less than the LCO.

DG-1244 was issued in September 2010 for public comment. I will be discussing the changes between Rev. 0 and Rev. 1 in the upcoming slides.

Next slide, slide 7. Reg Guide 1.93 applies to both single and multi-unit sites and is consistent with the Standard Tech Specs.

Next slide. The regulatory basis for Reg Guide 1.93 is GDC 17 which specifies that two independent offsite circuits shall supply power from the offsite transmission network to the onsite distribution system.

The licensee shall provide redundant onsite AC and DC power supplies. You shall provide sufficient capability and capacity to ensure the fuel design limits and design conditions for the reactor coolant pressure boundary are not exceeded.

Next slide, slide 9. For pre-GDC plans applicable design criteria are provided in the UFSAR and this was added to Rev. 1 of Reg Guide 1.93.

Next slide, slide 10. Revision --

MEMBER STETKAR: Let me stop you now because now you're getting specific changes. The Reg Guide carries forward what protected the LCO completion times from the original version of the Reg Guide that was issued in 1974. That initial -- those were the early days of the world.

Dinosaurs were crawling out of the swamps. We were trying to figure out what Tech Specs might be, what might be included in Tech Specs. Apparently some really smart people back then got together and decided that there were limits like two hours and 24 hours and 48 hours and 72 hours. They made a lot of sense and they have been around for a long time.

There have been a lot of lessons learned in the last 36 years regarding, as we already noted, the amount of time that might be required to restore off-site power based on the cause of its failure, the reliability of onsite AC power systems depending on how they are configured and the equipment we use.

The question is why in 2011 do we need to specify those arbitrarily selected times in a new version of this Regulatory Guide? What benefit, technical benefit is added by specifying all of those explicit time limits in this Regulatory Guide?

MS. RAY: I would ask for some help.

MEMBER STETKAR: That's a generic question. I don't want to get into is 24 hours reasonable for X or is 72 hours reasonable for Y. The question is why do we need to specify those times generically in this Regulatory Guide?

MR. MATHEW: This is Roy Mathew from NRR, Electric Branch. The perspective is Rev. 0 was the basis for operational restriction. You have less than minimum number of sources which were onsite at offsite power. This revision is the set changing the basis of the tech spec. We still have to keep the original basis for the tech spec so that is carrying forward.

We have specific section for Part 52 plans where my understanding is -- correct me if I'm wrong -- the tech spec has not been finalized so staff is still reviewing it. Rev. 1 is carrying forward the original assumptions and basis for operation restriction, limiting condition operation. Nothing has changed. The only change we are making we learned a lot of lessons from the 2003 blackout.

When we say offsite power is operable, we learned that you have to look at the grid side. You have to know the condition of the grid to make sure the offsite power is operable.

MEMBER STETKAR: You're getting into some details that we will discuss, I think, a little bit later under some of the different scenarios. I'll pull you back to what do we need to specify those times in this revision of the Regulatory Guide.

MR. MATHEW: I mean, like I said before --

MEMBER STETKAR: And if we do, I would personally like to know what the technical basis is for each of those times generically for every plant in the country because that's the way this will be applied.

MR. MATHEW: One caveat is the Reg Guide is specifying the standard consistent with the standard tech spec. Wherever the difference is the tech spec dictates the real conditions like limiting condition. Whether it's 72 hours or 24 hours, that is dictated by the plant tech spec.

MEMBER STETKAR: I understand that and I understand that if I'm a licensee and I want to adopt standard tech specifications, I need to provide adequate justification of why they apply to my site. I understand that if I'm the licensee and I decide to depart from the standard technical specifications, I need to provide analyses to justify that departure. I understand all of that.

Why in the Regulatory Guide do we need those numbers; 24 hours, 72 hours, 48 hours? Why do we need to perpetuate something just because 36 years ago some smart guys decided those seem to be reasonable numbers because they didn't know anything better.

MR. KOSHY: This is Thomas Koshy. Let me try to explain a little bit. Historically in the days when we arrived at that time, it was primarily based on doing the FM chill maintenance activities so that we can maintain the availability of the power supply.

That was at the time considered necessary to do some of the FM chill maintenance while power can continue to remain. Over the years with our detailed study on grid capacity and also operating experience, we found we can still limit that time but we did not find any basis to reduce that time any further.

Essentially what we have done is our operating experience with the original dose that we have given for critical maintenance activities and over the years we are happy with those times that we have chosen, therefore we are choosing to prefer those limits as an upper-bound limit even though it can be indicated sooner than that to give us a reasonable level of confidence in safety.

MEMBER STETKAR: Two things, Tom. If you could, sit back from your mic a little bit because you're breaking up a little bit on this end. I think my whole question is is there -- what regulatory benefit is achieved from placing the specific numerical values of those times in this regulatory guide given the situation that we are in in 2011 where every plant has a set of technical specifications.

We do have generic technical specifications and plants are allowed to depart from technical specifications if they can justify it. And new plants under Part 52, as has already been noted, the technical specifications have yet to be solidified, if you want to call it that, because the designs in many cases have additional levels of redundancy that might justify broadly different LCO times.

The question is really why do we need the specific numbers in this regulatory guide which may perpetuate --

MR. MATHEW: Okay. Let me --

MEMBER STETKAR: -- which may perpetuate those numbers for another 36 years? I don't plan to be here for that review but, you know, Joy might.

MR. MATHEW: Let me try this. If we think

the time specified in the tech spec either in the standard tech spec or the plant specific tech spec is less conservative, we should have changed it in this reg guide. We have no reason to believe that we have to change any of the -- just like offsite power we said 72 hours.

Three days is reasonable to do maintenance or something needs to be done with one circuit inoperable. From a tech spec point of view the numbers haven't changed. Staff hasn't come across there's an issue that we need to revisit and change the time. We could take off all the numbers but it doesn't matter for operating reactors. All those numbers are the same. It's going to be plant specific.

MEMBER STETKAR: Right at the moment that's true. My concern is that we now have plant specific Tech Specs. We have generic Tech Specs. We have regulatory guides. If I take a snapshot right now all of those numbers are the same, I think. At least the Standard Tech Specs and the regulatory guide.

If anything changes, we'll have to reissue all of those things. We'll have to reissue a new version of this regulatory guide because somebody

decided that, well, it ought to be 18 hours rather than 24 hours for some condition, that that's a more reasonable time.

Or maybe 103 hours is more reasonable than 72 hours. It comes back to why do we need the specific numbers in each document. What benefit do I have from those numbers in this Regulatory Guide given where we are in 2011, not where we were 36 years ago.

CHAIRMAN SIEBER: I think you can extend that thought a little bit, too, because none of this is risk-informed.

MEMBER STETKAR: None of this is risk-informed and I understand that.

CHAIRMAN SIEBER: None of this takes into account the station blackout coping times for different plants. They are different for different plants so the risk varieties and it's not clear to me that we are dealing with risk in a rational way when we set up discrete numbers based on somebody's judgment that doesn't have the experience of the 2004 blackout, or even the experience that we have gained over overseas this year.

MR. CASE: If I can just add -- this is Mike Case. From a regulatory philosophy and a regulatory guide perspective it's almost always better

to write the number down because what it provides -- a Reg Guide is to articulate the current staff position.

Although you're right it probably doesn't have as strong a technical basis as you want, you want to write down what the current staff position is so that when you get in requests that says, "I want to do it in 18 hours," it makes the staff focus on that and they can always relax the staff position but it makes them focus on it and it makes then write up the reason why so that's why you always want the Reg Guide to have the current staff position.

MEMBER STETKAR: Okay. Thanks. That helps me really understand it. Now I will ask the staff then to supply to at least me, if not the rest of the subcommittee, the technical justification for each of those times in writing, please.

MR. CASE: You will probably get something close to what Tom is talking about.

MEMBER STETKAR: I honestly want to understand --

MR. KOSHY: Our attempt is to give an upper-bounding value through this Reg Guide such that we can live with an acceptable level of availability.

MEMBER STETKAR: I understand the intent.

MR. KOSHY: Remember we recognize in some cases it may be liberal and some case may be limited. But over all the years we have learned that at this given window of time is reasonably adequate for most maintenance activities.

Ideally, we like to have these power supplies when all the power supply whenever the plant is operating. On the other hand, we have to do certain maintenance activities so the operational readiness can be preserved.

So in these two extremes having power always available and having some unavailability is a margin that we try to draw. So what you have needs to be seen as an upper-bounding value within which we think the operational safety is preserved.

MEMBER STETKAR: Okay. Thanks.

MR. KOSHY: So this is a guide number as an upper value so that the staff can say, "Okay, we long as you remain within limits, we consider it good enough."

MEMBER STETKAR: Okay. Thanks. I understand everything you just said and I do, on one level, understand the need for both applicants and the staff reviewers to have something, some specificity that you can form the review against. I understand

that.

All I'm asking for is a written summary of the technical bases because there must be some technical basis for those numbers. It can't just be, well, it seemed reasonable at the time and people can usually do the maintenance within these times.

I don't think we should regulate the nuclear industry based on somebody's idea that it seemed sort of reasonable that somebody might be able to do the maintenance within the time. There must be some documented technical basis for those numbers because they are very specific numbers.

They are as specific as saying I should not exceed a departure for nuclear boiling ratio of more than X. There are detailed analyses that are done to support those numbers that we use in terms of our review criteria. I understand the goals.

I understand in some sense the need for having specific numbers against which to perform the review. I'm asking now for the technical basis for those numbers. If there is a reasonable technical basis, I'll be quiet but I haven't seen it so I would like to see it.

MR. WAIG: This is Gerry Waig. I'm with the Tech Spec Branch. As you well know, all of the

LCO action statements have got completion times associated with them. Those identified in the NUREGs 1430 through 1434 for the current Rev. 3 are primarily, if not all, deterministically based.

They have no risk-informed tech spec completion time that currently exist within the NUREG that has been specifically identified as a PRA grade completion time. Getting to your question, to come up with an engineering evaluation of why is this 24 hours and why is this 72.

Having started in the business back in '72, 1972, I can tell you that your assumption is correct that typically what was done was how long would it take to perfectly restore an aux feedwater pump RCS loop, an offsite power line, and what is the risk.

It wasn't the risk that we're talking about today, it's just an assumed risk, not a calculated risk of an event occurring, where you relied upon that function. That's where those numbers came from if you look through it.

I have not seen an engineering study or an evaluation that says that's how we got to the 72 hours where this number was evaluated under the criteria we're talking about today.

It was really done more of a gut feel of how long it would take to restore a system and some reasonable ability of the licensee to complete that time without having to shut down. I don't know if that answers your question or not.

MEMBER STETKAR: Well, it answers --

MR. WAIG: It may not make you feel any better with your question but that's --

MEMBER STETKAR: Okay.

MR. MATHEW: From a laboratory perspective --

MR. KOSHY: From our operating -- this is Koshy again. From our operating experience in the past years that time that we allocated is very reasonable but we have only very rare requests for asking for extension so that is an affirming experience through which we feel confident that the time that we are using at this time is very reasonable.

MR. MATHEW: One other point. I mean, if you look at the regulatory requirement it's 50.36 and 50.36 says you have to have a limiting condition operation and operating limits and safety limits, things like that. We have NUREG 1734 -- 1434 through different reactors where we have specified to meet

those requirements.

In this Reg Guide we are not changing the original basis of any of those. Still everything is the same except we thought from an available electrical power source because of the 2003 blackout in order to determine the offsite power availability operability you need to consider other things other than already specified in the original version. That is a main change.

MEMBER BROWN: So that's the inverters you're talking about?

MR. MATHEW: No.

MEMBER BROWN: That's the only other item that's listed under those six or seven items that you specified.

MEMBER STETKAR: They'll get to that. We'll talk about specifics, I think, in a little bit if I ever let you. I didn't go look at the tech spec NUREGs. I just didn't have time in preparing for this meeting. Back in the basis section of those Tech Specs are there any analyses referred to for the basis for those completion times?

MR. WAIG: No, it's deterministic in general. In fact, it does reference Reg Guide 1.93 in a number of those cases.

MEMBER STETKAR: We have a self-fulfilling sort of loop that we are now perpetuating in the future.

MR. WAIG: That's correct.

MR. MATHEW: Most of them are engineering judgment, plant operating experience. All those things are factored, too.

MEMBER STETKAR: I'd better let you continue now.

MEMBER BROWN: Before they go on, could you answer me one basic question? When I was looking at this trying to see what the difference is from Rev. 0 to Rev. 1 where you had a statement in Rev. 0 relative to what was required under GDC 17 that differs from what's specified in Rev. 1 in your presentation.

In Rev. 0 you quoted -- you didn't quote. Excuse me. You stated that GDC 17 required that each of your two physically independent offsite transmission networks should be continuously available, or claim that each can be made available within a few seconds.

Note the word "each." In your quote here you say GDC 17 and now the new requirement is that only one is required to be available within a few

seconds. Has GDC 17 changed from Rev. 0 or is that a misstatement in Rev. 0?

MR. MATHEW: Let me clarify. This is not quoted verbatim. This is paraphrased.

MEMBER BROWN: In Rev. 0 or Rev. 1?

MS. RAY: It is paraphrased in Rev. 0.

MR. MATHEW: Yes. If you were to quote exactly what the GDC 17 is in a nutshell, you need two circuits for offsite power source. One of the circuits can be available within a few seconds. The other circuit can be delayed. It doesn't specify how much delay. That's the requirement in a nutshell for the offsite power source.

MEMBER BROWN: You substituted the words sufficient and time. All I was just trying to get to was GDC -- I was trying to figure it out. GDC 17 was just paraphrased incorrectly in Rev. 0 that each had to be available within a few seconds so that's what has been going on for 30 or whatever, 26 plus or 30 years.

MR. MATHEW: It's the same but we can say it in a different form. I would say one circuit has to be immediately available and the other circuit can be a little bit delayed. The GDC 17 doesn't say how much delay you can have.

MEMBER BROWN: All I'm saying is that the original Reg Guide said they both had to be like that and you're saying now they don't. I just wanted to make sure we were quoting the general design criteria as it is actually specified in 10 CFR 50, whichever is appropriate, Appendix I.

MR. MATHEW: We'll make sure legally we are defining the same way.

MEMBER BROWN: The reason I ask it looks like a relaxation. If you look at Rev. 0 and you go to what you are proposing now, it looks like a relaxation or a reduction in the standard that you're applying. That's why I was asking the question.

I want to make sure exactly what were the criteria before and exactly what are they now. They should be the same. That's what you're telling me but that's not the way they read. I don't have a copy of that with me and, besides, the print is too small.

MR. MATHEW: We will take back and make sure we captured it verbatim so people will not misunderstand or misinterpret. These are the exact words.

MEMBER BROWN: Okay. I'll read what he gave me.

MS. RAY: Okay. Next one, slide 10.

Revision 1 also includes a discussion on Grid-Risk-Sensitive Maintenance. To minimize risk, licensees should consider performing grid reliability evaluations as part of maintenance risk assessments per the Maintenance Rule 10 CFR 50.65(a)(4).

For example, if degraded grid conditions exist, licensees should consider rescheduling the maintenance. Otherwise, licensees can use equipment protection measures or compensatory measures to limit risk.

Next slide.

MEMBER STETKAR: Before you change this, and I apologize. I know I'm blindsiding you but that's okay. What's the grid?

MS. RAY: It is --

MEMBER STETKAR: Where does the grid start when I go out from a plant? Obviously the grid is not at the switchgear that's inside the plant but where does the grid start?

MS. RAY: It's the pressure breaker from the transmission lines. You also have the safety buses and that's where we monitor the whole thing.

MR. WAIG: Typically tech spec space starts at the high-side breaker of the step-down transfer.

MEMBER STETKAR: And that's the interpretation for this Reg Guide?

MS. RAY: Yes.

MR. WAIG: Yes.

MEMBER STETKAR: Good. I'm actually glad to hear that because I've seen people get very creative of saying the grid is the transmission lines that connect to my switchyard. That's the grid. That's the responsibility of the TSO or whoever is running the interconnected grid out there.

My responsibility as a licensee starts at the high-side breakers out in the switchyard. Who is responsible for the switchyard? Who is responsible for contingencies in the switchyard if I have a breaker-and-a-half scheme and I've got one of my switchyard buses out. Does the TSO run contingency analyses for that configuration under this Regulatory Guide?

MR. MATHEW: Let me go back.

MEMBER STETKAR: The answer is yes, I'm happy. That's all I needed to know.

MR. MATHEW: Yes.

MEMBER STETKAR: Okay. Thanks.

CHAIRMAN SIEBER: Only by agreement --

MEMBER STETKAR: I want to make sure there

is clear understanding that the TSO knows that he has to account for contingencies in my switchyard.

CHAIRMAN SIEBER: There's no legal requirement under NRC regulations for him to do so. The only requirement would be an agreement between the TSO and the plant operator that would require them to do that. I think those are in place in most utilities but I'm not sure it's in place in every one.

MR. KOSHY: This is Thomas Koshy. Let me add some thoughts to that. The NRC side comes from the controls and FERC has mandated a procedure through which the interaction with the operator have now become a requirement. We have worked with our friends in FERC to make that happen so that we have reliable information between the offsite power available to the site.

Now through this protocol that we have established from the NRC side and FERC side, there is full communication between the parties so that the contingency condition is identified, maintenance activities are shared and, therefore, we have a great confidence in the ability of the offsite power.

MR. WILSON: Tom, this is George Wilson. I'll add one thing.

In Generic Letter 2006-02 one of the

questions that was in that was also to ensure that they had a legal agreement with the grid operator to provide lots of stuff. That's further, just like Tom said, been amplified working with NERC and FERC on reliability standards. There is a standard called Nuc 001 which requires a lot of that stuff. That is actually the reliability law back from the grid operators to the nuclear power plants.

MEMBER STETKAR: My only concern is to be absolutely clear that those agreements and the understanding of the grid operator is such that they understand that those contingencies extend all the way back to the high-side breakers of my plant.

For example, if I have -- if I've got a dual voltage switchyard and I've got a transformer out of service out there, or if I've got a breaker-and-a-half scheme, I've got one of my buses out of service, that is a contingency that the so-called grid operator knows that under these agreements they need to evaluate.

MR. WILSON: In addition -- this is George Wilson again -- it becomes the plant's responsibility to talk about if they are taking a battery or equipment back out to the grid operator to ensure that it's a two-way communication. That's there.

MEMBER STETKAR: That's pretty well clear going out from the plant. There is at least one new plant design that is very creative about where they define their switchyards and what they define as their switchyards. That sort of led me to a bit of concern about a possible gap.

MR. WILSON: It's confusing because generically it's been the FERC/NERC NRC interface point is the first disconnect after the transformers and that's actually defined as the FERC interface point that the industry came back and designed so it should be generic we know.

MR. MATHEW: Actually, just to clarify, part of the maintenance rule action, everybody knows that maintenance rule, therefore, requires the licensees to assess the risk, manage the risk when they do maintenance, so that involves any grid work on the transmission side or switchyard on the grid side.

If they are making changes or maintenance, they should inform the plant so they can assist the rest. Maintenance rule encouraged them to do it so there is a protocol to do that.

Also, the maintenance rule Reg. Guide 1.81, if you look at that it specify where is the boundary of the switchyard so it saves the first

breaker at the high-voltage site so everybody is clear what the jurisdictions are.

MS. RAY: Let me just add the standard that George was referring to, Nuc 001, is also referenced in this Reg. Guide. It's Rev. 2 of Nuc 001.

MEMBER STETKAR: Good. Thanks. Thank you.

MS. RAY: Next slide, slide 11. Communication with Transmission System Operator. This is also included in Rev. 1 of Reg. Guide 1.93. A nuclear power plant operator should be aware of grid conditions that could affect operations and the operability of the offsite power system. The operator can also be informed of information from grid studies to manage risk.

Next slide, slide 12. Reg. Guide 1.93 also includes information on passive designs. Passive designs may not have multiple power sources since they rely on passive systems for core cooling and containment integrity. But they can use nonsafety diesel generators if no offsite power is available.

However, efforts should be made to restore any inoperable diesel or offsite power source. Passive plants and evolutionary plant designs should

be evaluated on a case-by-case basis since they have different power sources.

Next slide, slide 13. Revision 0 and Revision 1 discuss operational restrictions. These restrictions are based on the intent of GDC 17 and are based on three assumptions. First, meeting the LCO.

Rev. 0 stated that in order to meet the LCO the LCO would be met when the sources were available per GDC 17. Rev. 1 states that the LCO is met when all LCO required sources are operable per Tech Specs.

Rev. 1 is also more specific in terms of voltage, capacity, and capability for the electric power sources.

Next slide, slide 14. For continued operations during the loss of required electric sources, licensees should evaluate the safety significance to prevent further degradation of electric power sources. Examples are continued power operation or immediate shutdown. This is similar to Rev. 0.

Next slide, slide 15. If compliance with the tech spec LCO is not restored within the completion time limits, the licensee should initiate an orderly shutdown. Rev. 1 makes minor

clarifications. The nuclear power plant can return to rated power if the tech spec LCO is restored during shutdown. However, if grid conditions worsen, the licensee should consider a manual trip.

Next slide.

CHAIRMAN SIEBER: If the licensee determines the grid condition is not suitable, he's suppose to trip his plant? What does that do to the grid?

MR. MATHEW: They have to look at the tech spec for limited condition operation. If they don't have one circuit it will say to do certain actions. If they don't have two circuits, they will say whether your onsite power is available. It doesn't mean they have to immediately shut down. They have to follow the action statement in the tech spec.

CHAIRMAN SIEBER: You have to look at the effect of the licensee's plant on the rest of the grid to determine whether it will have emergency power to meet the plant's needs even with it shut down.

MR. MATHEW: Yes.

MR. WILSON: Yes. This is George Wilson. In addition, not only that we actually have a NOED process. In the NOED process we give notice of important discretion. It actually has a section

called Severe Weather.

We have granted in the past if the grid is actually stressed and in emergency action level, even if we have granted an extension and left the plant stay up on line until the grid recovered because we would not force the nuclear power plant to go down and then cause the grid to collapse upon itself so we worked very closely with NERC and FERC to answer your question.

We wouldn't make them shut down and then their offsite power not be there because it would cause the grid to collapse. There is a process that we would go back out and look at the emergency levels or action levels that the local grid was on by the transmission operator and evaluate that.

CHAIRMAN SIEBER: Well, that's an important consideration because if you require the nuclear power plant to shut down, or it does shut down, that places the grid itself in a much worse shape than it was in before. If the grid collapses because of that action, it affects the plant that actually shut down because it loses it supply for emergency services.

MR. WILSON: And that's one of the reasons that we have constant contact. There actually is grid

emergency with MOAs and MOUs that NERC will actually call HOO, the work headquarters operations officer, and we actually evaluate that. In fact, the electrical branch does a grid report Monday through Friday and evaluates the grid so we take into consideration. We look at that.

CHAIRMAN SIEBER: I think that needs to be coordinated. For example, if the grid stability is in question because of high-customer loads and, for example, you may be not able to maintain 60 cycles or voltages are low, all units are at their maximum capacity, you may want to reduce consumer load before you start cutting off generation because that really adds instability to the grid and will cause it to collapse.

MR. WILSON: Yeah, the grid operators following the emergency protections. They had talked about buying power and bringing it in. When you remove hard load or soft load there's a couple of terms --

CHAIRMAN SIEBER: In the Northeast blackout there were grid operators who did well and others who did not do as well.

MR. WILSON: I understand.

CHAIRMAN SIEBER: Fortunately we were the

ones that did well.

MS. RAY: Slide 16. This provides a comparison of levels of power system degradation. Rev. 0 defines 5 scenarios and Rev. 1 defines 7.

The first level in Rev. 0 one AC power source less than the LCO includes both one offsite source and also discusses the one onsite source less than LCO. This was separated and put as two levels in Rev. 1. Rev. 1 also adds one inverter less than the LCO.

MEMBER STETKAR: You're going to go through each of these individually?

MS. RAY: Yes. There is a slide on every single one of them.

Next slide, slide 17. The Regulatory Positions are to ensure that when electric power sources are less than the LCO, the nuclear power plant is in a safe operating mode. When Tech Specs allow continued power for operation during a specific degradation level, this is contingent on Tech Specs and the following:

The reliability, availability, and capability of remaining sources; that the required maintenance does not further degrade the electric power system or jeopardize safety; and there is

continued compliance with Tech Specs. Revision 1 also states that Tech Specs is a prevailing document if there are any inconsistencies between the Tech Specs and the Reg Guide.

Revision 1 also specifies coordination between the grid operator and the nuclear power plant. In addition, Revision 1 has a statement saying that the post-trip voltages shall be verified.

MEMBER STETKAR: So if I'm a new plant now and I don't -- I haven't really developed my technical specifications yet, I look at the generic Tech Specs and they say, okay, battery can be out for 24 hours and diesel can be out for 72 hours and so forth, that sounds pretty good to me.

My guys can probably do the maintenance within that time so I'll put those in my Tech Specs. Those now become my plant specific Tech Specs. There are obviously no inconsistencies between those and the numbers in this Reg Guide so everybody is happy. I haven't had to justify those numbers because they were in the generic Tech Specs. Everybody in the Regulatory accepts those numbers.

CHAIRMAN SIEBER: Deterministically.

MEMBER STETKAR: No. We already determined that there is no deterministic basis for

them. In an analytical sense because I don't have to justify as long as I adopt the generic Tech Specs, those numbers.

MR. MATHEW: So long as they are within that part.

MEMBER STETKAR: Okay. Thanks.

MR. KOSHY: This is Thomas Koshy. There is a technique and review process of the application in which we are looking at the design if they can follow those numbers and still have adequate safety. It is that initial technical review of the activity that the engineers became confident that we can live with the numbers.

Fortunately newer designs have only made things better. Therefore, this can remain valid and for the new generation of reactors, in fact, there may be some relaxation coming when the offsite power requirements are reduced for the passive designs. Those changes will happen but we are giving significant credit for the initial review of the design also to see that the proposed Tech Specs can remain valid.

MEMBER STETKAR: Well, if I'm a new design and I say my LCO for battery is 24 hours, everybody is happy and the reviewers don't question that because that is accepted.

MR. KOSHY: I can give you an example. In fact, the Westinghouse Owners Group came for relaxing the DC power supply outage time. There was a staff review and they could not confirm that the logic system will put them in a decimal mode. We, in turn, denied that request for the Westinghouse Owners Group.

MEMBER STETKAR: I understand if people come --

MR. KOSHY: We had a process in place through which the technical people review and see those relaxations or extended time would remain suitable at the same time.

MEMBER STETKAR: Okay. Thanks.

MS. RAY: Slide 18, Scenario 1: When the available offsite AC power sources are one less than the LCO. When the offsite power system has no redundancy there is an associated risk for the loss of offsite power because the ability to quickly restore offsite sources would be lost.

The remaining offsite circuit could be susceptible to the same issue. There is an increased consequential trip probability. And this would also affect the availability and capability of offsite system.

The Regulatory Position states that power

operation may continue up to 72 hours. Revision 1 eliminates details on the ramp-down rates and that the plant could provide reactive power up to 48 hours.

Revision 1 also states that a shutdown would be in accordance with Tech Specs. However, Rev. 0 stated that a cold shutdown was needed within 36 hours.

Next slide.

MEMBER STETKAR: Not quite yet. In the discussion the discussion serves to provide a bit of background information to justify these Regulatory Positions and the discussion says, "Operating experience indicates that availability and reliability are higher for typical offsite AC power sources than those of a typical onsite AC power source.

Thus, if risk is evaluated in terms of availability and capability, the risk associated with the loss of an offsite power source, the source with higher availability, would appear to be more severe. However, this apparent difference in severity is usually offset by easier maintenance of the offsite power source."

What's the actual operating experience to justify that? That is sort of the bases for why you feel about why the relative times for restoring an

offsite power source are what they are. I'm interested -- you know, this refers to actual operating experience. I would like to see what that is.

MR. KOSHY: This is Thomas Koshy. We have not kept the full statistics in my knowledge as to clearly validate those numbers. To give the historic perspective on this, diesel engines were originally designed for a small system. It was never designed to become a class for any power source.

What we have done we have put a turbo charger on it so that we can raise the power and essentially make it operable as a standby source. When you look at availability for the offsite power system, what we find historically is most of the out data are localized faults and generally even automatically isolated such that that regularly has become sooner than any problem associated with an emergency system.

The fact is that most emergency diesel generators wouldn't start only when there is a valid start attempt. There is no system to displace failures in the starting system. These are generally problems we have with diesels.

But at the same time, I should admit that

in all it has improved, but pretty often when you review the start data you are going to surprisingly find out if wouldn't start because something has failed in the starting system.

When you collectively evaluate this data, in fact, there is a full list of electrical related failures on diesels which I looked into about a year-and-a-half ago and that was a very big list. But when you compare that with the offsite power availability, it continues to be significantly superior.

But we can add some numbers reported even from the diesels failures are actual valid demands and we can get some numbers from the database. That is the only valid data that we have at this time.

MEMBER STETKAR: Okay. I just get a bit concerned when regulatory guidance cites operating experience and we can't actually find that operating experience to support this other than sort of the anecdotal information that we just heard.

MR. KOSHY: We do have that data on on-demand failures, yes. That is --

MEMBER STETKAR: I understand diesel data. What I'm questioning is the assertions that offsite power transmission lines, bus availability out in switchyards, transformers and so forth, are

unilaterally higher availability than diesel generators. Maybe they are.

I'm just asking since this cites operating experience, we must have that. We've got 104 operating units and many of them have been operating for many years and they must keep information on their offsite power supply availabilities.

I'm not talking about total loses of offsite power here because we're not talking about station blackouts. I'm talking about the unavailability of one transmission line or a bus in the switchyard or transformer.

MR. KOSHY: We do not collect reports of that nature because we do not have a recording requirement. The only way we get that type of information is going to FERC and NERC and collecting some data which they may have because we have significantly relaxed the requirement about 15 years ago, I think. Sorry, maybe a little more than 15 years ago.

That type of information aren't coming to us. We have to emphatically obtain if we have a very serious interrupt in that area. I have been living as a resident but the fact is the nuclear broke down more often than my lights flicker in my home. As a

resident in the neighborhood to say that my power supply was more available than the power from a nuclear station or the offsite power supply at the other site.

MR. MATHEW: One more clarification. Actually, if you look at the offsite power, you recall offsite power is a preferred power source. The reason why it's a preferred power source it is a huge system. It's a grid with humongous power source coming in, transmission lines going. The availability of offsite power compared to onsite power which has only two diesels available for offsite power is more of a preferred type source.

MR. MILLER: This is Kenn Miller. Do we know was that change made to the current revision versus the old revision?

MS. RAY: There was additional discussion, yes.

MR. MILLER: We did add some more.

MS. RAY: Scenario 2, slide 19. This discusses a loss of redundancy of the onsite power source. Revision 1 adds the intent of GDC 17. Licensees should make efforts to restore an onsite AC source and verify the offsite source can accommodate shutdown.

The Regulatory Position states that power operation may continue up to 72 hours if the redundant emergency diesel generator is tested or assessed within 24 hours.

Next slide.

MEMBER STETKAR: Thomas mentioned it. Why do we focus only on diesel generators? Two things. One, not all plants use diesel generators, especially newer plants. There is at least one design that uses gas turbines. I'm actually not concerned about it whether it's a gas turbine or a diesel generator.

What I'm concerned about is all of this seems to be based on the amount of time that is estimated to repair a diesel generator. There have been plants, for example, that have had fires, short circuits, mechanical failures that have impacted bus work where I had a relatively destructive amount of damage to a bus.

That's also one of my onsite power supplies. I'm concerned why we focus only diesel generators. Why does the world revolve around repairs and failures of diesel generators and not consider a broader scope of onsite power sources.

MR. KOSHY: This is Thomas Koshy. We have addressed the possibility of losing all AC through an

SBO. What we are saying is all the years we found out there could be certain vulnerabilities. Even if we have two redundant planes, there are certain distinct possibilities in which these two could become unavailable. That is the problem that we solved with the SBO. In most designs you have to put redundant planes. We are assuming if, at all, there is a catastrophic failure that causes a bus failure, it will be seen as a single failure and the redundant plane will be able to deal with the accident.

In other words, the total collapse of the safety system is addressed through SBO. The random events that could take out one is addressed through redundancy so we solved that problem in two different ways. I hope that answers your concern.

MEMBER STETKAR: I'm not sure that it does but I'll have to think about it a little bit. This scenario, too, basically says I can go in and throw a crow bar across the phases of one of my safety buses, thereby vaporizing both the bus and the crow bar. I can continue operation for 72 hours in that configuration because I've determined that 72 hours is a reasonable time frame to repair a diesel. Is that correct?

MR. KOSHY: But what we are saying is this

time relevance is given for dealing with reasonably manageable problems. Like you said, vaporizing of the copper and failing we expect much more prompt action. In fact, Waterford had a failure of that nature and they opted to react.

I'm expecting some reasonable judgment in that case. Maintenance can recall that activity and all other systems are fine and you have off power available belonging to that window, it's reasonable.

We need to make a judgment call and we have our resident inspectors for the government and our managers who periodically look at these actions to see if we are addressing an issue on hand appropriately.

MR. CASE: This is Mike Case. There is another LCO on the availability of not the sources but the AC distribution so if you lose a bus, you're in the distribution LCO and that is probably more restrictive than -- you don't go to the availability source.

MEMBER STETKAR: Thank you.

MR. MATHEW: All the support systems are also affected.

MEMBER STETKAR: That's probably it. Thank you very much.

MS. RAY: Slide 20. This is Scenario 3: When the offsite system is not available or there is inadequate capability but the onsite system is still available.

The Regulatory Position states that power operation may continue up to 24 hours. If one source is restored, Level 1 is applicable. However, if no offsite source is restored, the plant could be in Mode 3 within six hours. Rev. 0 has stated that cold shutdown or the lowest pressure temperature state was needed within 36 hours.

Next slide, slide 21. Scenario --

MEMBER BLEY: Can I ask a question about shutdowns? Occasionally you mentioned tripping the reactor but can you explain the difference between immediate shutdown and an orderly shutdown? I can see the difference between a trip and orderly shutdown. I would think if you were doing an immediate shutdown you would also do an orderly shutdown. I was just confused as I read through this.

MR. WAIG: Typically the immediate reactor shutdown is implied in Tech Specs as an orderly shutdown. It isn't implied as being immediate as in pushing the reactor trip or scram push button.

MEMBER BLEY: But you seem to make a

distinction between the two and I don't know what that distinction is between immediate shutdown and orderly shutdown.

MR. WAIG: It could be misinterpreted from someone in the general public who read this. I think for most licensees the immediacy of it is based on the Tech Spec requirement to be in a mode in a certain period of time, in this case six hours.

Generally the six hours. Generally it takes four hours to get the plant from 100 percent power down to Mode 3 so that gives them two hours on the front end to prepare for it, making notifications, and four hours to shut down.

MEMBER BLEY: But then what you just said, you could call that either an immediate shutdown or an orderly shutdown.

MR. WAIG: It could be implied.

MEMBER BLEY: I'll pull out a couple of these places where I think you've made a distinction and I don't get it. I don't know what is distinguished between the two.

MEMBER STETKAR: Thirty-six years ago -- well, 30 years ago there were plants that interpreted immediate shutdown that if you had eight hours, when it was seven hours, 58 minutes, and 30 seconds the

operator was posed above the manual trip button and your power was 100 percent. That was the interpretation of an immediate shutdown compliance with the Tech Specs. I don't know whether that -- that may have changed.

CHAIRMAN SIEBER: The licensees didn't do that.

MEMBER BLEY: There were some, Jack.

MEMBER STETKAR: Maybe we're one for two.

MR. MATHEW: Shutdown we are referring to in this section you follow the cool down rate specified in the Tech Specs. You follow all of those. It's consistent with the Tech Spec terminology and the rest of the action statements.

MEMBER BROWN: That is a difference from Rev. 0. If you look at Rev. 0 it says in roughly 36 hours you have to go and achieve a cold shutdown rate for a number of these circumstances within 36 hours. That was deleted from all. There were several in Rev. 0 also said ramp down rate should be considered. That was deleted from Rev. 1 also.

There was a considerable reduction in what I call operational detail in terms of getting from point A to point B and they only really addressed the time you could consider to operate. After that it was

go shutdown in accordance with your Tech Specs.

Not being a commercial operator, that's different from the naval nuclear plants the way we did things. I didn't have a context but it was a deletion. It was just a significant difference between Rev. 0 and Rev. 1, just a change in how to you get from power to nonpower. It also allows us to sit at very low powers in Rev. 0 which were also deleted from Rev. 1. I think they were all deleted.

MS. RAY: That's correct.

MEMBER BROWN: Okay. That's one of the significant differences between 0 and 1.

MS. RAY: Slide 21, Scenario 4: When there is a loss of redundancy in the onsite and offsite power systems. The Regulatory Position states that power operation may continue for up to 12 hours if there is sufficient capacity and voltage on the offsite system and there is an ability to restore one source within 12 hours.

If one source is restored, either Level 1 or Level 2 is applicable. Revision 1 eliminates the provision for staying at a minimum power level for 12 hours if conditions for a continued power operation cannot be met.

Next slide.

MEMBER STETKAR: Nope. Not quite.

MS. RAY: Sorry.

MEMBER STETKAR: The text for both Scenario 3 and Scenario 4 -- in Scenario 4 you've kind of paraphrased it. For Scenario 3 it says, "If the available offsite AC power sources are two less than the LCO, power operation may continue for 24 hours or for the time period specified in plant specific specifications if it appears likely that at least one of the offsite sources can be restored within that time."

For position 4 it says, "If the available offsite non-site AC power sources are each one less than the LCO, power operation may continue for 12 hours if it appears highly likely that at least one of the affected sources can be restored within 12 hours and if the electric grid system capacity and voltage is such that a subsequent single failure would not cause a total loss of offsite power."

I had to finish the sentence. Who determines (a) what is likely, and (b) what the appearance of likelihood is, and what is the difference between appearing likely and appearing highly likely. Those are now words that appear in regulatory guidance so --

MR. KOSHY: This is a case -- This is Tom Koshy again. This is a case where we will be checking the essential conditions through our FERC and NERC friends who will essentially share with us, for example, conditions like flooding, some which may have affected some transmission towers and we find that to be a bad situation, that is what we will consider to be a very bad situation where we lack confidence that it can be recovered --

That will be a case specific evaluation where we need to engage other parties who have knowledge of the wider area natural rather than just licensee's own word. That is where I'm sure our office will come in the picture and operations will collect the valid data and make a relevant judgment. This will likely be a decision based on other information available to us.

MEMBER STETKAR: Tom, is that collective decision -- when you say us, is it made with NRC staff or is it simply something that the licensee and the TSO make that determination? In other words, who makes this determination that, indeed, it's highly likely that power will be restored or it's not very likely that power will be destroyed? Is the staff involved in that decision making?

MR. KOSHY: We reach them and they will get in touch with the headquarters for the collective knowledge based on that.

MEMBER STETKAR: Let Tom finish because it's important to get on the record.

Can you repeat that?

MR. CASE: It's a licensee decision.

MR. MATHEW: It's the licensee given the feedback from the grid operator what the conditions are. However, we verify that, whether that is true or not.

MEMBER STETKAR: After the fact. My question is is there a requirement --

MR. KOSHY: While it is happening.

MEMBER STETKAR: Well, that's what I was asking. Is there a requirement that the licensee contact the region or that the region contact headquarters at least getting the region involved in this situation when they make this determination?

In other words, suppose everybody is the internal optimist and everybody knows that we are going to get power back and 24 hours expires and everybody discovers that they're wrong. Is that decision, is that judgment collectively -- does the staff, through the region at least, have input to that

decision?

MR. CASE: It's a licensee decision. We have enormous operational awareness by having the resident there and all the other ways that we are informed of what the plant is doing. It's basically a licensee decision. We would become involved because it would be unusual at best they could do this without NRC operational awareness.

CHAIRMAN SIEBER: But if it's in the middle of the night and the resident is not there, it could happen.

MR. WILSON: It could happen but, like I said -- this is George Wilson again. It could happen but we followed up on the grid situation. The residents come in and they didn't like what they read. We've called the actual local transmission operators and got the exact status. If that would be the case, we would come back and challenge the licensee in their decision. I know that is after the fact.

MEMBER STETKAR: That's after the -- yeah. That's like 12 hours which could happen.

MR. WILSON: It wouldn't be good for the licensee if we challenged their fact and had it --

MEMBER STETKAR: Okay.

MR. MATHEW: The point I was trying to

make is let's say they have 24 hours they had to take some action. They think they need more time so the process they use is enforcement description, NOED process. That process --

MEMBER STETKAR: I understand. That's extending it. What this says is that I'm the licensee and something happens. A bus vaporizes out in the switchyard and I call up my TSO and I say, "Okay, run your contingency analysis or give me or contingency analysis that you've already run for this condition."

They say, "It's pretty likely that we'll hang in there for 12 hours." I decide, fine, I'm going to stay operating. If the TSO says, "Ah, gee. It's the hottest day in the summertime. We just lost a transmission line."

It's 50 miles from your site but because the way the grid works it looks like you might lose the other bus, then I have to shut down according to this. It's not coming to the staff and saying, "I need four or five more hours." It's making that determination that I can, indeed, remain operating.

MR. MATHEW: You're right. Usually the licensee makes a decision and if the resident inspectors have concerns over NRR electrical events getting more, they can still take enforcement action.

They still want to make sure the offsite power is operable. In some cases we may find that they are not forwarding the Tech Spec per Region I which clearly says that you have to communicate with the TSO and make sure your duties are reliable and operable.

MR. KOSHY: This is Thomas Koshy again. If it is bad news, it spreads fast. Or if there is something very unusual, it moves very fast and we get elevated attention on it.

If it trips or the transmission line came down, those things we consider to be discoverable in a reasonable amount of time. For example, if it is in the peak of summer load or if something happened, it's made known to our regional staff who will in turn be consulting with the Electrical Branch for making a good decision.

Generally speaking, if you didn't hear about it, we will think that it was a minor problem that could be managed within the outage time and the judgment would be fine and we have a way of looking at it through our staff to see if the call made by the licensee was reasonable. The sooner we hear about it, we will be better prepared to deal with it.

MS. RAY: Slide 22.

CHAIRMAN SIEBER: Let's continue on.

MEMBER BROWN: Go back on the nuances just to follow up on John's comment. That was one of the interesting things relative to differences. If you look at Rev. 0 Scenario -- I don't know which one it was, both offsite power, less than two offsite.

The offsite power are two less than the LCO. That's 3. There you use the term if it appears likely. In Rev. 0 you also did the same thing for Scenario 4 which is one offsite and one onsite. You used likely again.

Rev. 1 you have now changed 4 to say highly likely as opposed to just likely. There is a nuance change in one scenario to the next. I guess that was one thing that I didn't quite understand. Why change it at all if you are going to maintain continuity?

MR. WAIG: When I was reading this, I read it as being more restrictive in that you have a comfort level that is going to be highly likely that they will get the line restored prior to reaching your --

MEMBER BROWN: That's in Scenario 4.

MR. WAIG: Right. So likely, highly likely --

MEMBER BROWN: I understand. After 30 years of one thing and the exact same condition, now we're getting less comfortable with the words. It seems that when the previous basis for sticking with these is based on operational experiences, we're comfortable with the performance times and everything else.

The changes are interesting. That's one point. I understand your point. I don't want to belabor that. It's just something to think -- it just got me thinking. I don't know what to do with that right now.

MR. WAIG: In think to put it in practical terms, if you have a real actuation you lose a line. It's pretty easily restored likely. If the tower goes down on that line, it's not going to be easily restored or likely that it's going to be restored within that CT, that Tech Spec completion time.

MEMBER BROWN: Okay. Now, the second question was relative to the deletion of all the 36 hours from power down to shutdown condition, whatever the circumstances were where you deleted all those.

I presume the licensees because of the guidance in Rev. 0 would have positioned their Tech Specs to be consistent with what is in here. Now

that's gone so instead of 36 hours they may choose to achieve a shutdown condition in 48.

MR. WAIG: Typically they --

MEMBER BROWN: There is no guidance now. It just says you should shut it down with a few exceptions where you use the word promptly.

MR. WAIG: Because we followed the Standard Tech Spec format. After 24 hours had expired, there would be an LCO 303 which has that shutdown sequence clearly identified within the LCO 303 so rather than just regurgitate the 303 requirements, we just said follow the Tech Specs after the 24 hours so we deleted that 36 out of there.

MEMBER BROWN: But weren't those -- An LCO 303 -- is that a naval nuclear propulsion emergency operation system? I have no idea what you're talking about. I'm just looking for where they go to find these to develop the LCO 303. Is that the Reg Guide and that's why it reads that way?

MR. WAIG: That's their standard text.

MEMBER BROWN: Yes, but it was probably based on this. Right?

MEMBER STETKAR: A 303 is when you get out of your --

MEMBER BROWN: They probably got the

numbers from these guidance documents.

MR. WAIG: That's where it came from.

CHAIRMAN SIEBER: Why don't we try to move along.

MEMBER BROWN: Let's go on. Deleting them was questionable. There was no basis for deleting the numbers. That's all.

CHAIRMAN SIEBER: We have five more slides to go and four minutes to do them in.

MEMBER BROWN: You're going to manage this better than I did the last one. Right, Jack?

CHAIRMAN SIEBER: Yes, I am.

MEMBER BROWN: Thank you for being blunt.

MS. RAY: Scenario 5: When the onsite sources are two less than the LCO. The Regulatory Position states that power operation may continue for two hours unless one source is restored in which case Level 2 is applicable. Otherwise, a shutdown is needed for Tech Specs.

As stated, Rev. 0 had the statement that shutdown is needed within 36 hours.

Next slide, Scenario 6: When the available onsite DC sources are one less than the LCO. The Regulatory Position states that power operation may continue up to two hours. If one source is restored,

there are no restrictions. Otherwise, a shutdown is needed for Tech Specs.

Rev. 0 had stated a shutdown is needed within the next 36 hours. Rev. 1 also includes a statement for passive reactors where the battery should be monitored so they can perform functions for long duration.

Next slide. Scenario 7 is new to Rev. 1 This is when there is a lack of required redundancy in the inverters. Regulatory Position states that power operation may continue for 25 hours. When one inverter is restored there are no restrictions. Otherwise, a shutdown is needed for Tech Specs.

MEMBER STETKAR: What an inverter?

MS. RAY: It is --

MEMBER STETKAR: I know it makes AC out of DC but this generically applies to inverters. Now I've seen plants that have inverters that supply very smooth AC power for instrumentation. Those are old designs. I've seen plants that have inverters that supply AC power for all protection and safeguards functions.

They are, in fact, the surrogates for the DC batteries in the new plant designs. It strikes me that the effects from having one or the other of those

inverters out of service could be quite different. Yet, there is no distinction.

Any inverter is apparently an inverter and it's okay to have an inverter out of service for 24 hours because all generic inverters are generically the same and they all provide the same function.

I was curious because this is something that's new. This is one of the few things -- this is newly new. It's not the missing combination of one onsite power source being available that was missed in Rev. 0.

This is the only new electrical thing in this entire Regulatory Guide. I was curious now since this is 2011 and we really understand things, what is the basis for the 24 hours for any generic converter regardless of what function it provides in any plant design?

MR. MILLER: Can you say again what were the two examples?

MEMBER STETKAR: In old plant designs -- and I have to be careful because I get trapped in the same genericism that we all do. In most older existing plant designs inverters were used to power instrumentation divisions where you needed a nice smooth reliable source of power. You have an

alternate backup supply and things like that.

In some new plant designs their protection and safeguards actuation functions are, in fact, AC powered. They are not DC powered. They are AC powered from inverters. The batteries exist in the plant but the batteries exist to provide two functions.

There are some actual DC fired squib valves or DC motor operated values that need DC power but the DC batteries from a protection and safeguards actuation function only power the inverters. Those inverters now are not -- they are different than instrument inverters in the old plants. You follow me?

CHAIRMAN SIEBER: If they're powering the protection system and they fail, the protection system actuates and shuts down the plant.

MEMBER STETKAR: For a reactor trip that's true from that division. For a safeguards actuation that's false because the safeguards actuation is energized to actuate so you lose that division of safeguards actuation.

CHAIRMAN SIEBER: Right. And there's more than one inverter.

MEMBER STETKAR: That's right but in that

case that inverter is functionally equivalent to a battery in an older plant design.

MR. WILSON: These inverters we're talking about from the safety-related batteries need either the 120 or the 125 volt safety-related buses. That's these specific inverters that we're talking about.

MEMBER STETKAR: Okay. Those are the --

MR. WILSON: Those are your safety-related inverters that go from your safety batteries and transfer power.

MEMBER STETKAR: But what do -- what are the loads from those safety-related AC buses, bus instrumentation or --

MR. MATHEW: This is Vital 120 power for typical power plant. It feeds controlled power instrumentation of circuits. This is not part of the RPS instrumentation.

MEMBER STETKAR: In new plants it is. Yes it is.

MR. MATHEW: We're talking about the specific section of the Tech Spec which is currently -- I don't know what the Tech Spec section is. There is a section called Vital AC. These are the inverters they are talking about.

MR. CASE: It's a specific section that addresses the inverters for the standard plant for Tech Specs -- Standard Tech Specs. I don't know if it includes what you're referring to or not.

MS. RAY: It may be helpful to include a finished --

MEMBER STETKAR: The first -- when I read this I understand this in the context of currently operating plants and the Standard Tech Specs. I understand this. I am aware of at least one new plant design, and I don't recall off the top of my head if there is more than one that, indeed, has offered their protection as fast reactor trip.

I'm not worried about reactor trip as Jack mentioned. Downpowering that is good but -- well, it's the safe direction. The safeguards actuation if I lose power, if that inverter is out, I've lost that entire division.

Plus, indeed, if you pick up the instrumentation, I've lost everything associated with that division. If the intent of this is to target the scope of inverters as it's understood for currently operating plants, it may require a bit of qualification because this Regulatory Guide explicitly does apply for new plants also.

MR. WILSON: This is George Wilson again. We need to be careful. There is also a catch-all Tech Spec, it's either 305 or 306, which causes you to cascade down. If you're going to look at a new plant design, you have to look at the distribution system for that plant design.

As you had asked the question earlier, we said there was LCOs for the distribution system. Well, there is also LCOs for other systems. If you look at a new plant design, this is generic for the Standard Tech Specs.

If you look at the new plant design, as an SRO or an operator of that plant, I have to look and if I take this down what are the other LCOs I'm in. If this is performing an additional function and a new plant design, not only will they be in this LCO for the inverter but they will be in another associated LCO for the other function which might be more limiting.

If the LCOs don't cover it, you cascade down through the LCOs. There's actually a catch-all LCO, I think it's 305 or 306, which forces the cascade down through different Tech Specs if it's not addressed and that is a catch-all that would handle the situation that you're talking about.

MR. WAIG: I think, too, in the very first paragraph of the Reg Guide they refer to this Reg Guide applies to single and multi-unit plants and it is consistent with the Standard Technical Specifications which is the standard plant design that this is derived from.

MEMBER STETKAR: Currently operating nuclear power plants, not new designs.

MR. MILLER: The ones that match are CE, Westinghouse, GE, Babcock & Wilcox. That's what all the Standard Tech Specs are based on.

MR. MATHEW: If it's a new reactor which is not a standardized type reactor, then I had to come up with the new LCO.

MEMBER STETKAR: This comes back around to my concern about specifying times because if I look at Scenario 6 where I have one battery out, I continue operation for two hours.

If I have a new plant design and I have one of my inverters out which, indeed, is worse than having a battery out from a plant, I can continue operation for 24 hours. According to this Regulatory Guidance published in 2011 that applies for new plants and existing plants.

MR. KOSHY: This is Thomas Koshy. I

mentioned before that if there is a new design coming, our design review process looks into the availability of the Tech Spec. I mentioned the case where Westinghouse Owners Group came and asked for extension for the specified time.

The staff denied it because of the pump for the logic system that they are relying on for certain actions. In fact, what I recall is requesting production of the pump to containment would have helped the situation. Staff, in turn, denied that request.

MEMBER STETKAR: That was --

MR. KOSHY: The review process in which we are going to ascertain if it is suitable to give an extension of the time and at the same time if the existing time can apply to this new design.

MEMBER STETKAR: The second part is what I'm interesting in hearing. The first part is I'm an applicant and I'm not asking to extend beyond 24 hours. I'm just invoking the Standard Tech Specs. I'm going to keep my inverter out of service for 24 hours -- 23 hours, 59 minutes, 58 seconds, and not shut down my plant because that is consistent with the regulatory guidance. That is accepted regulatory guidance.

MR. KOSHY: In that case, the staff will be reviewing if that will be a risk or not before approval.

MEMBER STETKAR: How and when do they review that? I'm not aware of the Tech Spec reviews looking at risk or challenging any of these standard times.

MR. KOSHY: Okay. When initially when the applicant submits it, and also before the approval the staff is making a well-informed decision for the design that we are giving a license with the Tech Specs that is generally acceptable. That is part of the licensing review process.

MR. MATHARU: They, Tom. This is Singh Matharu of the Technical Branch. Just to emphasize what we're discussing here, I think we are preparing the LCO for the battery system which is typically two hours. Then we are saying that the LCO for the inverter which is supplied from the battery and may be more critical is now 24 hours.

I think what we need to clarify here is the basic assumption that we started from that you have inverters that are used for control logic. Then you have inverters that are used for protective functions which is the RPS, and maybe the plant action

system as they are called in some cases.

Essentially the standard design for the pressurized and for the boiling water is logical in order for trade. The typical design has boiling water for the protection aspect where we energize to actuate. Then for the control function there is a little separate set of inverters that I use.

Because of the redundancy in the water system, we are allowing more time, whereas in the DC system in the existing design can only be two batteries, one for each train. That is why the electrician in the LCO use the inverter.

CHAIRMAN SIEBER: Could I ask you, sir, to state your name and affiliation, please, for the record?

MR. MATHARU: Yes. My name is Singh Matharu and I work in the Electrical Branch, NRR.

CHAIRMAN SIEBER: Okay. Thank you.

MR. KOSHY: I have specific background in BWR design. In that case the motor function essentially in the RPS system and in the later designs inverters were needed for the ECCS situation part also.

The difference between inverter given more relaxation than the battery because once the system

has actuated, the logic made up and then, for example, ECCS motors can continue to run even if inverters are not available.

Whereas the diesel system is needed for assist to be made and also for operating the control system for the breakers even for operators to take manual controls. The absence of inverters can compensate during the accident investigation phase for directly manually controlling ECCS once the situation has began.

What I'm saying is inverters can produce more relaxation than DC power sources because of the further capability in manual assistance being continuously available. This I'm speaking in the light of the BWR design that I'm familiar with.

CHAIRMAN SIEBER: Does that answer your question?

MEMBER STETKAR: No, but that's okay.

CHAIRMAN SIEBER: Well, why don't we move on then.

MR. MATHEW: I think the short answer is if it's not a standard design, we have to review it as part of the technical review whether 24 hours mentioned here is conservative or not.

MR. WILSON: And this is George Wilson.

What I was trying to emphasize, I have to look at the form fit function of what design does. It's not a one catch all because I might have -- if I take out a system and it affects another system, I might be in multiple LCOs.

That's what I'm talking about case effect. It's the same effect if my design is different and I take out a piece of equipment and it takes out multiple pieces of equipment.

Unless it specifically states like with cooling water for a diesel that I'm both in the diesel and the cooling water, then it's the responsibility of the licensed operator to cascade through the Tech Specs and see what all is affected and enter the appropriate Tech Spec at that place and that's what they're trained to do.

MEMBER STETKAR: I'm looking at the Tech Specs for a new plant design and they have two hours for a battery and they have 72 hours for an inverter and their inverters provide power to both their reactor protection and their safeguards actuation. It happens to be a boiling water reactor. We can go on.

MS. RAY: Slide 25. We received comments letters from four organizations and the majority of the comments were incorporated. There were six

comments on Section D, the Implementation Section.

There were two comments to use the terminology "Offsite Circuit."

The terminology "Offsite Power System" is used in this Reg Guide and consistent with GDC 17.

There was one comment to address those plants that may have variations or subtle differences in the Standard Tech Specs. The last bullet includes the wording that was included in Rev. 1.

Next slide. There was three comments stating that the nuclear power plant may not have access to the grid analysis tool and the transition system operator can verify the post-trip voltages and communicate this information into the nuclear power plant.

The wording in Section C (Regulatory Position) was revised as shown in the first bullet. The second bullet includes the revised wording in Rev. 1, Regulatory Position 1.

It was revised for consistency between Regulatory Position 1 and Regulatory Position 4. In summary Reg Guide 1.93 discusses the staff positions for when alternate power sources are less than the LCO.

CHAIRMAN SIEBER: Thank you.

MS. RAY: That's all I have.

CHAIRMAN SIEBER: Any questions? If there are no questions, why don't we take a 15-minute break until 3:30.

(Whereupon, at 3:13 p.m. off the record until 3:29 p.m.)

CHAIRMAN SIEBER: We will continue with the second section of this subcommittee meeting which is Regulatory Guide 1.218, Condition-Monitoring Techniques for Electric Cables Used in Nuclear Power Plants.

MR. BURKE: We have a new cast of presenters. Darrell Murdock is here to present this one from Brookhaven National Lab. Mike helped Darrell put this together.

Darrell, it's all yours.

MR. MURDOCK: Good afternoon. As you mentioned, my name is Darrell Murdock and I'll be presenting Regulatory Guide 1.218, Condition-Monitoring Techniques for Electric Cables Used in Nuclear Power Plants.

The purpose of this Regulatory Guide is to provide the essential elements of a condition monitoring program and a list of condition monitoring techniques.

This Regulatory Guide was generated in response to industry's request for guidance on condition monitoring techniques that the energy staff finds acceptable.

This Regulatory Guide applies to all cables within the scope of 10 CFR 50.65 which is the Maintenance Rule.

CHAIRMAN SIEBER: That includes underground cables that might be subject to water intrusion and so forth, plus cables in cable trays inside the plant.

MR. MURDOCK: Yes.

CHAIRMAN SIEBER: All cables.

MR. MURDOCK: Any cable within the scope of the Maintenance Rule.

CHAIRMAN SIEBER: Okay.

MR. MURDOCK: Next slide, please.

Based on operating experience, the number of cable failures show an increasing trend with plant age. These cable failures have resulted in plant transients and shutdowns, loss of safety functions, entries into LCOs, and challenges to plant operators.

Some of the NRC generic communication that document cable failures are Information Notice 89-63, Information Notice 2002-12, Generic Letter 2007-01,

and Information Notice 2010-26.

This upward trend in cable failures has increased the need for condition monitoring to ensure operational readiness of cables relied upon for accident mitigation and avoiding unnecessary operational transients.

The NRC staff was able to gather more than 200 records of cables that were severely degraded and that have failed from the licensees response to Generic Letter 2007-01 which was reviewed by the ACRS.

Based on that information that we gather from Generic Letter 2007-01 we were able to come up with two basic graphs that shows an increasing trend in cable failure with plant age.

This first graph shows the numbers of failures as a function of year in service.

Next slide.

CHAIRMAN SIEBER: Do you have a comment on the number of -- the limited number of cables in the 30 to 40 year range?

MR. MURDOCK: Yes.

MR. KOSHY: This is Thomas Koshy. I may be able to comment on that. In some plants where the cable failures are predominant they need gross replacement. Once a ground cable fails from moisture

intrusion, rather than taking a chance of another one failing, they replace all underground cables that may have a problem.

Such widespread replacement happened in about four or five plants where this type of failure happened a few times. That is why you'll see the number came down in the 31-40 period because of those replacements that many plants have done.

CHAIRMAN SIEBER: Have you taken the time or the effort to put this data in terms of percentages of failures for the number of cables that are in these various categories?

MR. MURDOCK: Yes.

MR. KOSHY: This is again Thomas Koshy. Let me put it slightly differently. These failures did happen during normal operating conditions. This was an indication for us the cables are failing contrary to our expectations that cables are good for a long time.

What we are trying to answer is if this many cables failed under normal operating conditions, under design basis events the number of failures could be higher. We are trying to reach this problem from a preventive perspective. In a sense, we want to manage this cable failure well ahead or it becomes a

serious problem when we have potential design basis events.

During design basis events, power will be lower, current demand will be higher, and the duration of operation will be more challenging than what has happened during this span of normal operational activities. That is a problem that we are trying to solve by trying to get ahead of the curve.

CHAIRMAN SIEBER: Okay. So --

MR. KOSHY: That is the reason we took this approach when we saw this trend increasing from the data we collected in the Generic Letter.

CHAIRMAN SIEBER: Okay. So the answer to my question is no, you don't have data in terms of percentages.

MR. KOSHY: That is correct which is the reason we proceeded with the limited information.

MR. MATHEW: Let me clarify some more. Actually, we issued a summary report in 2008 which is available publicly. This has more graphs and more data which summarizes all the data in regard to part of the General Letter response.

The bottom line is we are seeing an increase in the failure rate. To answer your question why the 31 to 40 years the graph looks smaller,

because not all the plants are in that range. As regard to data, certain number of plants were in that group so that is why it's a small percentage.

MR. MURDOCK: Specifically in 2007 when the Generic Letter was issued only 40 percent of the plants were within that age group of 31 to 40.

CHAIRMAN SIEBER: Okay. Now, that's a new Reg. Do you know the number?

MR. MURDOCK: I can give you the ML number. The summary report was issued in November 12, 2008. This report is available publicly. The ML number is 082760385.

MS. ANTONESCU: Can you send that to us, please?

MR. MURDOCK: Yes.

MEMBER BLEY: Does that show this kind of statistics against the number of plants in operation that fall within the category?

MR. MURDOCK: I'm sorry. What was the question?

MEMBER BLEY: Okay. These are growing with age but also we have a number of plants that are quite old. Then we have plants, quite a number of them, that are middle-aged plant. From a picture like this you can't tell -- do you have one against age of

the plant at the time of cable failure instead of this by calendar year which doesn't tell us very much except there are more of them now than there were yesterday?

MR. MATHEW: We have a curve that shows number of failures versus years in service.

MEMBER BLEY: Okay.

MEMBER STETKAR: It's in that reference.

CHAIRMAN SIEBER: We'll get the reference.

MR. MATHEW: We wrote up good information in this report.

MEMBER BLEY: Great.

MR. MATHEW: For the purpose of the time we didn't capture all the slides here.

CHAIRMAN SIEBER: We'll get the reference and read it.

MEMBER RYAN: You mentioned there cables that are wet versus cables that are not wet. Do you have failure data on cables that are wet versus not wet? I'm interested in underground cables that are in the saturated zone or in the zone of water fluctuation.

MR. MATHEW: No. The Generic Letter we didn't ask specific questions like that. We said any which is covered under the maintenance rule of the

scope. The failures include both cables that are wet but we could find out --

MEMBER RYAN: How do you know that they include both if they are not separated into two groups?

MR. MATHEW: Right. So if you look at the report we have the cause of failure, contributing cause. You can look at that and see what caused the cable to fail. Some of them will say moisture intrusion or submerged.

MEMBER RYAN: Okay. So it's not exactly explicit that it's under water but if it's submerged --

MR. MATHEW: If it is submerged, then most likely contributing cause is going to be moisture.

MEMBER RYAN: That's fine. So there is some data to that effect.

CHAIRMAN SIEBER: For the purposes of trying to figure out what is the best test as sort of a side issue and why don't we just move on to that. Slide 7.

MR. MURDOCK: To have an effective condition-monitoring techniques licensee should chose a technique or combination of techniques based on plant-specific installations, applications, operating

conditions, and operating experience.

CHAIRMAN SIEBER: Okay.

MR. MURDOCK: The condition-monitoring of cables may be limited to a representative sample of cables based on operating condition and operating experience. The frequency at which licensees due condition monitoring may be adjusted based on demonstrated plant specific cable test results and operating experience.

CHAIRMAN SIEBER: I presume you do this in the same kind of way that you do with other in-service inspections? For example, steam generator tubes. You start with a small sample size, you find some failures, you expand the sample size, and increase the frequency at which you test. Is that correct?

MR. MURDOCK: Similar to that, yes.

CHAIRMAN SIEBER: Okay. Thank you.

MR. MURDOCK: Some of the most commonly used condition-monitoring techniques are very low frequency test, visual inspection, dielectric loss-dissipation factor or tan delta, partial discharge test, and time domain reflectometry.

Next slide, please. For plants entering their relicensing period, the generic aging lessons mandates that these plants perform some condition

monitoring. Aging Management Program XI.E1, XI.E2, and XI.E3 address cables condition monitoring.

Specifically, XI.E3, which is the inaccessible power cables not subject to 10 CFR 50.49 Environmental Qualification Requirements. Under Detection of Aging Effects, it states that the first tests for license renewal are to be completed prior to the period of extended operation with subsequent test performed at least every six years thereafter.

The applicant can assess the condition of the cable installation with reasonable confidence using one or more of the condition monitoring techniques. The draft guide version of Reg Guide 1.218 is referenced in AMP XI.E3. Also, Regulatory Guide 1.218 can be an effective tool that licensees can use to fulfill the monitoring requirement put forward by the Generic Aging Lessons Learned.

CHAIRMAN SIEBER: Could I presume that since this appears in the GALL report that there is no requirement for plants that are not undergoing license renewal?

MR. MURDOCK: Well, the idea with this, or what I was trying to convey, is that even plants that are beyond the 40-year life also require to do condition monitoring and licensees can use Regulatory

Guide 1.218 as a tool.

MEMBER STETKAR: If I have a currently operating plant and I've been operating for --

CHAIRMAN SIEBER: Three years.

MEMBER STETKAR: -- 15 years. I was going to use that as an example.

CHAIRMAN SIEBER: Okay.

MEMBER STETKAR: -- 15 years, I don't need to implement this cable monitoring program until I reach the age of slightly before 40. Is that correct?

MR. MATHEW: Yes.

MEMBER STETKAR: This does apply prior to the period of extended operation or slightly before.

MR. MATHEW: I think what Darrell was trying to say is if they have to test the cables for aging management part of the license renewal phase, right now the license renewal in our Aging Management Program says you have to test the cables but it doesn't say what kind of test and what kind of techniques to use.

You could use this Reg Guide. There is no requirement. This is just a guidance licensees could use. This is a guidance to choose if they want to use any of the matters.

CHAIRMAN SIEBER: On the other hand, if I

go back to Slide 5 and add those three up, 190, 198 failures total shown on this graph on Slide 5.

MR. MATHEW: If you look at the summary report, you will see the breakdown of how many failures. If I'm not mistaken, there are about 268 failures reported. These failures are not really the exact numbers because many of the licensees when they start operating the plant, they haven't had much of a database for tracking failures. We think that they may have more failures than really reported but this is the information that is part of the Generic Letter.

CHAIRMAN SIEBER: This Reg Guide doesn't address plants that aren't in license renewal?

MR. BURKE: No, not directly.

MR. MATHEW: Not directly.

MR. BURKE: Under the maintenance rule you do have to do some type of performance monitoring for all of your systems in the maintenance rule.

CHAIRMAN SIEBER: Yeah, but you could just measure the cable and that wouldn't match any of the recommended surveillance that's in this Reg Guide. Right?

MR. WILSON: This is George Wilson. I want to clarify something. The licensees have to show that their systems will perform the function just like

the maintenance rule. To answer your question, let's say that the cables are in a wetted environment, or there is a test that they know that they are not testing a characteristic.

There have been violations already written in the field by the different regions for the failure to test the cables properly. We've already written violations against the industry on this.

The reason that the Reg Guide came out is we wanted the industry to know that there's different types of tests that are out there and the characteristics. To answer your question, an existing plant they are not committed to this. This is a brand new Reg Guide.

CHAIRMAN SIEBER: Right.

MR. WILSON: But have violations been written for inadequate corrective actions? Not having the testing criterion XI? Yes. there have been several violations against cables in the operating plants.

CHAIRMAN SIEBER: Violations based on QA program?

MR. WILSON: That is correct.

CHAIRMAN SIEBER: Yeah, I remember those.

MR. WILSON: So, to answer your question,

yes, they won't be required to commit to this regulatory guide but they do have to ensure that their cables can perform their functions and there have been several violations.

CHAIRMAN SIEBER: Okay. Move on.

MR. MURDOCK: Next slide, please. On of the documents that serves as a basis for Regulatory Guide 1.218 was NUREG/CR-7000 which is the essential elements of an effective cable condition monitoring program.

This NUREG lists the essential elements for an effective cable condition monitoring program, industry guidance and standards, and the experience and observations of others who have studied or conducted electric cable condition monitoring in qualification testing.

This NUREG also provides guidance on the following technical aspects; the selection of cables to be included in the program, characterization and monitoring of cable operating environments and stressors, selection of the most effective and practical condition monitoring techniques, documentation and review of cable condition monitoring testing and inspection results, periodic review and assessment of cable condition and operating

environments.

MEMBER REMPE: When I looked at the Reg Guide it said like a representative number of cables should be selected. What's the thought behind what makes representative. Is it a 10th or one out of 100 or what?

MR. MURDOCK: It should be based on the operating condition in which the cable is in and the operating condition and operating experience for that cable.

MR. KOSHY: This is Thomas Koshy. What we are attempting to clarify there is let's say the cables that go to a storage pump room has about 20 of them and they are new cables. Even though there is a moisture condition, they believe that a cable will be good for 10 or 15 years.

But if you sample one or two and make sure that your measurements are consistent and it doesn't show any conditions of degradation, they can proceed to go with that feeling in a sense, reduce of frequency of testing.

As soon as they find that the readings are going down, they should take a wider sample and take more drastic action. What we are saying in that particular type of cable and in the range of

environment, don't try to test all of them but sample studies are practically achievable and can be achieve reasonable confidence.

MR. BURKE: We're not as prescriptive as, say, the ASME code would be for ISI on typing.

CHAIRMAN SIEBER: Right.

MEMBER STETKAR: Has any guidance been developed? Not necessarily regulatory guidance but I'm thinking EPRI guidance or any I guidance? Have any of those organizations developed guidance about how you perform that selection process or sampling process? It is a valid question. If you just say, well --

MR. KOSHY: This is in an evolving stage in the sense the EPRI has found their first generation for cable testing and they did not ask for an endorsement. They have put out a document and I think they are trying it out in the field. I'm hoping that in the coming years they may come up with some better recommendations on which we may be able to endorse or maybe do some generic reviews on. This time it is still evolving and we do not have an EPRI document that we can endorse.

MEMBER STETKAR: Okay. I was just thinking, you know, there is guidance and it's even in

GALL Rev. 2, for example. When I think of buried piping, for example, you know, there's guidance that if I have this type of material and this type of environment, I need to do this many samples.

If I have these other types of materials in a different type of environment, I should perform a different number of samples. Quite a bit of thought and effort went into that guidance. It allows you to relax the number of samples that you take depending on experience or it tells you that you should increase the number of samples. I was just curious in the cable regime whether there was a similar effort. I guess what we heard is maybe EPRI is doing something but --

MR. VILLARAN: This is Mike Villaran from Brookhaven Laboratory. There have been several documents that came out with guidance as far as cable testing and, as you said, testing under different environments you require different types of tests and more increased frequencies of tests and so forth. Several of those references are in the NUREG CR-7000. It is Sandia Report 0344. It's IEEE standard. I think it's 1205 that has information on testing --

MEMBER STETKAR: But that's the selection of --

MR. KOSHY: But that's not sampling. That is testing technique only.

MEMBER STETKAR: That's right. I was going to make that point.

MR. KOSHY: There is no sampling guide available at this time for various environments that a nuclear plant is subjected to.

MEMBER STETKAR: You know, the example of, well, I have about 20 cables going to this location and it probably makes sense to sample a couple of them. I'm not using couple in the sense of two. It's in the sense of sort of a vague notion. The sampling program can be an important element of this testing and monitoring function.

MR. MATHEW: Maybe in the future if we have guidance in that area, we will put it in the future revisions probably. Right now I understand there are statistical sampling that is available that is industries choose to use it, they can use it.

Right now the focus is to characterize in a percentage sampling basis versus environment. We have, let's say, we have an environment which is a mild environment. You select certain samples. Maybe a statistical approach may be a better approach for now. That's what we envision.

MR. MURDOCK: Next slide, please, Slide No. 10. Regulatory Guide 1.218 has three Regulatory Positions, the first of which is essential elements of a condition-monitoring program. These elements which are listed are consistent with the ones that are listed in NUREG CR-7000.

Next slide, please. Regulatory Position No. 2 states that the NRC staff considers the use of appropriately selected combinations of typical cable condition-monitoring techniques to be an acceptable method for satisfying the regulations to assess the continuity of the systems and the conditions of their components.

The condition monitoring techniques selected should be based on plant-specific design, installation, and operating conditions and operating experience related to the cables used in nuclear plants.

Next slide, please, Slide No. 12. Regulatory Position No. 3 states that the cable condition monitoring should be augmented under these conditions for selected cables when the facility has:

Experienced failure of cables connected to critical equipment; operational history indicates failure of cables; there is a locally adverse

operating environment; industry operating experience with similar conditions and equipment configuration to those at the licensed facility indicate a need for augmented monitoring.

Next slide, please, Slide No. 13. Direct Guide 1240 was issued for public comments on June 13, 2010, and the comment period expired on August 13, 2010.

A large number of the public comments received pertain to weaknesses associated with a number of condition monitoring techniques. The staff responded to these comments by modifying the discussion of the condition monitoring technique as appropriate.

Next slide, please, Slide 14. In summary, Regulatory Guide 1.218 provides guidance on the essential elements of a condition monitoring program and a list of condition monitoring techniques that the NRC staff finds acceptable.

Next slide, please.

CHAIRMAN SIEBER: Do any members have any additional questions they would like to ask?

MEMBER STETKAR: One simple one. This is a good list of possible testing programs and benefits and definites for each one. Do you expect to update

this Reg Guide at a frequency that is more frequent than typical 25 to 30 year Regulatory Guidance updates to keep abreast with things that are being learned?

There are several of these testing techniques that are still fairly new, if you will. Show promise but, you know, the jury is still out about how effective they may be for different types of cable configurations.

MR. CASE: Where we are headed with the Reg Guide program is, you're right, 25 years is a way long time to revise them so we set up in the management directive a five-year program so we'll revisit all the Reg Guides within five years.

Hopefully a lot of them won't need updating. We can focus on ones like this where we want to get new information in. Quite frankly, the folks in License Renewal have GALL set up that way. They have got a good five-year program where they come back and they take a look.

MEMBER STETKAR: I was thinking some of the experience that we've seen in the license renewals where it's an evolving process. Many times the applicants will come in and say, "Look, you are asking us to commit to things that sound good on paper but we don't really have any real definite experience to

apply.

Whether it's cable monitoring or whether it's examination of socket welds or underground piping there are a few of these issues that are evolving. I'm glad to hear there is a plan to keep a breast of the developments.

CHAIRMAN SIEBER: What I think will happen there is sort of a parallel with between electrical cable and the steam generator tubes. For example, when steam generator tubes started to get faults and degradation and so forth, all of a sudden came new probes, new techniques, new ways of analyzing new inspection requirements, expanding scope and so forth.

I suspect that as these failures increase, if I can interpret these tables correctly, that there is going to be pressure in this area to develop new examination techniques, frequencies, ways to improve, and so forth, which I think should be the subject of IEEE codes.

I would encourage the staff to encourage the IEEE to take a look at this issue because, you know, as plants age, and every one of them is aging -- there's none that escape that as plants age -- there is going to be additional attention needed in this area.

MR. MATHEW: Actually, from our side, the Electrical Branch in NRR, we are actively involved with a lot of industry groups, internationally, too, with NEA, IEC. Actually, we are helping them to write some condition monitoring guides. We will release all this information. If there is any new lessons learned or operating experience coming out of that, we'll factor in the future revisions.

CHAIRMAN SIEBER: Okay.

MR. BURKE: One of the things that Mike mentioned earlier was some of us are up here because Satish Agrawal retired and he's not -- he's the one that wrote this but he's not around anymore to present it, but he's still IEEE chairman. He's interested in this issue. I would suspect he will want those IEEE standards developed that apply to this.

CHAIRMAN SIEBER: I think that the agency has told all of us that we had to retain the knowledge base as the agency ages and the people in it age and are replaced. I think I've seen some good examples where research has already done that. I encourage that here in particularly because we are all getting older and we need to maintain the knowledge that we have in the agency so that it can continue to function.

MR. MATHEW: We need an Aging Management Program.

MEMBER STETKAR: We already have aging management.

MR. KOSHY: This is Thomas Koshy. We have conducted some research at South Carolina University and they are developing a new technique which is a combination of two existing techniques. That appears to be promising.

We have genuine research happening. Also the LIDAR technology is being further tested. Pretty soon I hope that we may have one single test which would be applicable for various types of cables.

If those things become more promising and we have actual verified evidence that one test is good for all, we could soon consider endorsing that approach when the industry has matured enough to gain confidence in that approach.

CHAIRMAN SIEBER: Thank you. I would like to ask the members if they have any additional questions or --

MEMBER BLEY: Oh, questions. Okay.

CHAIRMAN SIEBER: Yes. Go ahead.

MEMBER BLEY: I thought you were coming for comments but questions, I do. Is there an

associated SRP or some new guidance for your reviewers for how to -- this lays out lots of different programs, tells how they all work and what they -- doesn't tell how they work, tells what they do and what you can tell by them.

Guidance to help your reviewers look over a licensee's plan to determine whether they think that plan may include several of these different test methods is really adequate for the kind of problems they are having.

MR. MATHEW: Right now we don't have anything. Maybe in the future.

MEMBER BLEY: Do you think you need it or do you think this is enough?

MR. MATHEW: This is enough. I mean, any reviews staff always looks at applicable Reg guides or any other documents like IEEE documents. Those are all given. Inspectors they look at in terms of license and basis so what is licensee committed to.

MEMBER BLEY: I guess what's guiding me here is we've seen these in license renewals. We've seen the stuff on wetted cables and that's really related to this and the problem there and that there were no specific requirements associated with wetted cables.

They have been urged to put together a program using these kind of methods to look to the future. That's a program that requires judgment on the part of you folks to decide, or the NRR folks, to decide if what is being proposed is adequately implementing a combination of these things. I'm just wondering how do we make those decisions.

MR. MATHEW: That's being done through various inspection arena. Say, for instance, there is a design inspection, DCBI inspections. They look at the design and they look at the component. If the cable is selected, they look at that aspect.

In the licensing review we focus on regulatory requirements. For a cable typically they had to follow the GDC 17 requirements and they had to follow the requirements. In the licensing phase we look at whether they meed the regulatory requirements and the applicable regulatory guides staff looks at those.

From an inspection perspective they have enough guidance to look at what is adequate surveillance, what is adequate maintenance, what current testing they need to do.

MEMBER BLEY: Okay. Well, it hadn't sounded that way when we heard people talk about it,

especially with respect to wetted cables. Maybe it is here. It seems you have a good tool here for people to use if they really know how to go from this catalog to a program. I'm just wondering where that comes up.

MR. MATHEW: Matt has --

MEMBER BLEY: Good judgment is, of course, it but there's a lot of stuff there.

MR. McCONNELL: My name is Matthew McConnell --

PARTICIPANT: This is --

CHAIRMAN SIEBER: One at a time, please.

MR. McCONNELL: This is Matthew McConnell. I'm with the Electrical Engineering Branch. I'm responsible for reviewing a lot of the cable issues that come across our path. I've been supporting license renewal on several of these issues including what you're referring to as wetted cables.

I wanted to make sure there is clarification between what is considered a wetted cable and a submerged cable. We consider those different. We don't think any of the techniques that are provided even in this Reg Guide are going to justify continued submergence.

What they are suppose to do is it considers that you have a cable that is installed in

its environment that it's actually qualified to, or designed to is actually a better word. There is no cure for having a cable or permitting a cable to continue to be submerged. I want to make sure that's clear.

As Roy was saying as far as having guidance or SRP guidance with respect to the reviewers, I think it's just general understanding that we would review and take any document that was available to us as far as IEEE documents, NUREGs, Reg Guides, manufacturer recommendations. We always bundle those things and take everything into consideration as we review.

MEMBER BLEY: But as to your first comment, I understand it's never a good thing. I also understand that we'll probably never get a way from the fact that various conditions will probably lead to these things being flooded again in the future. I was hoping to get something that integrates us together.

CHAIRMAN SIEBER: There are cable designs that are suitable for submerged operation. Unfortunately, none of them are in power plants that I'm aware of.

MR. McCONNELL: I think there are some in the Florida plants. There are some that their local

requirements actually specify that they have to have lead sheathed cables and the cables have to be submerged and able to survive.

CHAIRMAN SIEBER: The Atlantic cable that was laid 100 years ago and operated for many, many years.

MEMBER STETKAR: In the license renewal process when an applicant comes in with an Aging Management Program, right now this particular issue is admittedly an evolving issue but in principle as we go forward, an applicant will come in and say, "I'm going to apply a particular Aging Management Program for this set of cables and I will do that by performing this type of cable monitoring and testing."

One from column A and two from column B kind of stuff. Who reviews -- back to Dennis' question, who and when are the reviews of the details of those programs? Who does that?

MR. McCONNELL: That's our license renewal folks. I would like to defer to Cliff Doutt. They go out to these sites and perform audits but I think Cliff would be a better --

MEMBER STETKAR: So they are the folks who actually make the determination that, indeed, that particular combination is appropriate.

MR. McCONNELL: Absolutely. We make sure we are in constant communication as we are participating. I think, as Roy was saying, ICC is the insulating conductor committee of IEEE that is actually part of the 400 standards documents, or series of documents, that we are endorsing with this Reg Guide. Anytime there is an update or something to be learned, we make sure we keep them informed.

MEMBER STETKAR: But at that level -- and maybe the license renewal folks would like to weigh in on this. At that level it's really not an inspection function, is it? It's part of the staff's review of the license renewal application. Isn't it?

MR. DOUTT: I'll give it a shot. Cliff Doutt, License Renewal. Run it by me again, sir.

MEMBER STETKAR: The question is who performs the type of assessment that Dennis was talking about that said an applicant for a license renewal -- I'm thinking going forward now that we have some regulatory guidance that gives you a list of possible monitoring and testing techniques.

An applicant going forward will commit to implement some combination of those techniques in principle for different cables in their plant. Who in the staff reviews that list and says, "Yes, indeed.

This seems to be a reasonable set of techniques for the particular cables that you're proposing."

Is it done during the license renewal? In other words, is it done during the license renewal review or is it left to the regional inspectors after the license is renewed?

MR. DOUTT: As we did in GALL 2, you can tell we were leading so some of the things are similar. In ours we list some test techniques. We don't have them select them.

MEMBER STETKAR: Okay.

MR. DOUTT: Basically we're just saying you're committing to a program. It will be implemented at some point. As time goes on depending on the cable type condition, or whatever, it depends on the test.

In some cases we are very limited on what test we can run at this point. It's not shielded power or something like that. That selection depending on that program may not have selected it yet. We're just saying the program is in place.

At some point in time, and this has been a question we had when we were doing GALL 2, is what test would be appropriate. One of the ACRS comments at the time was the same thing we just got here was

where is that table with cable type and material and whatever and what test would you run.

We're not there yet. We essentially use the draft Reg Guide as a reference as well and we're somewhat in sync. The Reg Guide doesn't say these are things that might work depending on where you're at. That determination is evolving, just like you said.

MEMBER STETKAR: But in principle --

MR. DOUTT: Time frame.

MEMBER STETKAR: Yeah. If I have a plant that goes into the period of extended operation next year, for example, they will have in principle a testing -- you know, a monitoring and testing program that will specify procedures and frequencies and sampling and so forth.

MR. DOUTT: Well, one thing, sampling for us we've already determined the cables so from a E-3 point of view we already know the cable so it's not a sampling per se. Now, the overall cable monitoring program may include license for no cables but our cables are specific.

E-1, which is a visual inspection, is sampled but it doesn't involve testing. E-2 is testing but, again, specific cables are identified. We came up with the sampling like for piping or

whatever is an E-6 or E-4. That's where we end up.

MEMBER STETKAR: I understand that but, as was noted earlier, this monitoring and testing program applies to the full scope of all cables that are under the maintenance rule. I guess my question then, if I expand it back out to that, is the determination of adequacy of the program made simply by inspection, regional inspection.

MR. MATHEW: Actually, let me -- I think there is a procedure in the license renewal phase meaning 40-year plus. This is 71003, right? The proposed license renewal inspection that needs to be done at all plants. Then follow that procedure to see how the program was implemented. Part of that all these questions will come.

MEMBER STETKAR: And that's an inspection program. That's handled through the regions or --

MR. DOUTT: You're looking at once people went back and looked at the program. We've also in the process of going to 60 and 80 discussions is to what answer is effective, how they've been working, what test and things have been shown to be effective.

That is going on as well. A specific answer like saying, okay, this cable type or this configuration in this environment what test if

effective. There are programs usually in place at the plant.

I mean, existing program I knew but generally there is a test implementation there that they have either shown to be effective currently and they have gotten good results as far as relatively easy to implement. In some cases with certain cable types we are very limited as to what we can look at and that is an issue going forward.

MEMBER STETKAR: Okay. Thanks.

CHAIRMAN SIEBER: And the type of service that the cable is in is very important also.

MR. DOUTT: Right.

CHAIRMAN SIEBER: Whether it is continuously operating or not and what loads are on it.

MR. DOUTT: Right. Our major concern has been meeting voltage and lower voltage power. That's where our testing concerns are. This Reg Guide is much broader still.

CHAIRMAN SIEBER: Right. Okay. Thanks.

MR. McCONNELL: If I could just add one more thing. This is Matt McConnell again. There is a general expectation in the requirements for condition-monitoring techniques to be applicable

today. We've already specified that in 10 CFR 50.65 so that would be more of a regional type instruction.

CHAIRMAN SIEBER: Right.

MR. McCONNELL: As far as cables go because they have such a heightened interest lately, we are in constant communication with our regional counterparts.

CHAIRMAN SIEBER: Yes. But even though the regions have responsibility for inspecting it, they do it in the course of the inspection. The inspection manual really needs guidance from you, sir, to do it, and NRR.

MR. McCONNELL: Okay.

CHAIRMAN SIEBER: As I see it.

Okay. Are there any other comments from the staff that they would like to make at this time?

If not, thank you very much for your presentation. It's well done. The meeting is not over until 5:30 believe it or not so I want to use that time effectively to determine what it is we need to do. This is the Subcommittee of the Regulatory Policies and Practices. I'm not even on that subcommittee but I'm glad to be here.

There are a number of things that we can do. We will need to advise the full committee as to

what our intentions are on Friday and the alternatives that we have we can write a memorandum or full ACRS letter that says, "Issued these regulatory guides" as you have developed them at which time the staff will cheer.

Or we can decide if we will either hold an additional subcommittee meeting if necessary, or take it to a full committee meeting sometime in the relatively near future. If we take that course of action, we have to have a reason for doing so. What I want to do is I want to individually look at each Reg Guide so we are going to go around the room twice.

MEMBER STETKAR: Is this on the record or do you want to close the meeting?

CHAIRMAN SIEBER: I don't know. Should we do it on the record? I was going to use the transcript to figure out what everybody says.

MEMBER STETKAR: You're the chairman.

CHAIRMAN SIEBER: Let me keep it on the record with this caveat. The caveat is that what we say now represents a preliminary opinion of each of the individual members which may change as we think about it some more because we've only had basically our prep time plus three-and-a-half hours to think about it while we're here.

This doesn't represent a final opinion but it will help guide me as to what course of action we will take and what will be the elements of content in that course of action. What I want to do is go around the room for each one of the Regulatory Guides.

I'm going to start with 1.93 and I'm going to ask, first of all, do you think that we can issue a memo to the staff that says this Regulatory Guide is okay as it now exist for final issue. The answer to that is yes or no. If not, what needs to be changed.

I think, Joy, I'll start with you.

MEMBER REMPE: Okay. I guess I would say no because I would really like to see some of the comments raised at the meeting addressed before it's issued. There were a lot of issues raised about where do the hours come from for continued operation. The description of an inverter, I think, needs to be clarified.

There are a lot of other items that were brought up by different members. I think it doesn't need to be lengthy but just having a letter going to John saying what the basis of the hours is isn't enough.

I think that ought to somehow be -- even if it's not a great basis ought to be put in the Reg

Guide so that when it's updated five years from now that people know, "Well, that needs to be changed."

CHAIRMAN SIEBER: Okay.

Charlie.

MEMBER BROWN: Okay. The no means what and the yes means what?

(Laughter)

CHAIRMAN SIEBER: No means we write a letter.

MEMBER BROWN: Okay. What does yes mean?

CHAIRMAN SIEBER: Yes means that we send them a memo.

MEMBER BROWN: My side would be yes, send a memo. I paged through Rev. 0 and Rev. 1 item by item and list by list. The changes between the two were minimal. Roughly equivalent to separating the old position one into two and adding the inverters.

The second point being that the basic times at which the plants were operating stayed the same. The only thing deleted were the times to achieve a shutdown position. Yet, you referenced tech specs and those are fairly standard tech specs that people are using.

I just don't see where a formal letter would add anymore. I understand Joy's concern about

where is the basis for the times. John brought it up but they were developed 40 years ago based on experience. I tend to go with the point that experience has been validated to be relatively satisfactory.

CHAIRMAN SIEBER: The program is, not to argue with you --

MEMBER BROWN: Well, you can.

CHAIRMAN SIEBER: -- but four years ago there was not experience.

(Laughter)

MEMBER BROWN: Not to argue with you but --

CHAIRMAN SIEBER: The only experience is the one commercial plant that I happen to work at.

MEMBER BROWN: Oh, come on. No. I don't necessarily agree with that. There is a lot of operating experience with other types of facilities relative to backup power and all that type of stuff that people were able to draw on in whatever experience they had. In general I think that has probably been validated. My opinion is, yes, we go with the memo.

CHAIRMAN SIEBER: We will argue. Thank you.

MEMBER BROWN: Next time you won't ask.

CHAIRMAN SIEBER: I like to argue.

John.

MEMBER STETKAR: Surprisingly enough somewhere in between I think that we should not issue a memo. I think that --

CHAIRMAN SIEBER: Okay.

MEMBER STETKAR: The reason for that is despite my badgering, if you will, of the staff regarding the basis for the numbers, a lot of my concern was primarily the fact that we already have the technical specifications and there was a lot of discussion about each plant having it's own technical specifications or, for whatever reason, adopting generic technical specifications which, in principle, they need to provide a basis for.

My bigger concern was perpetuating these numbers in a regulatory document that doesn't serve a plant specific purpose. They are simply generic numbers. Yet, it said the plant specific technical specifications always trump this and for new designs they are developing their own technical specifications so we need to consider those separately.

The question is why perpetuate the numbers in this particular Regulatory Guidance when, indeed,

the numbers in the plant specific technical specifications, either for an existing plant or a new plant going forward, regardless of whatever Tech Specs they adopt, will be the operative guidance for LCOs.

This being the Regulatory Guidance doesn't have any merit. It does, indeed, from a reviewer's perspective prompt you to look at the different types of contingencies and configurations.

It explicitly does prompt you to make sure that there is an agreement in place with the grid operator and that agreement does look at different contingencies. There is a lot of useful guidance in there. It's just the numbers themselves.

It's apparently somewhat of a fundamental difference of opinion. For that reason, I would say I would like to see whether the staff has any feedback based on our discussions before we issue anything one way or the other.

CHAIRMAN SIEBER: Okay. We'll do that at the very end.

Ordinarily the chairman gets to not express an opinion but I'm going to anyway. I think no, we shouldn't issue a memo and that we need to go further. One of the things that bothers me is the numbers also because I don't see any big effort to try

to risk inform those numbers.

I think that after 40 years of operating experience with 100 plants that we ought to be able to do something from that operating record about what the risk really is.

Maybe risk information will tell us something different than arbitrary selections that were made 30 years ago when there wasn't a lot of data. On the other hand, if we tell them that, that is a setback for several more years probably in the issuance of this.

Does it make any difference when Rev. 0 was in 1974 and the first revision was in 2011? Maybe 37 years of elapsed time isn't bothersome. On the other hand, when I look at the differences between Rev. 0 and Rev. 1, they are not great.

MEMBER STETKAR: I think the only substantive -- if you cast the inverters aside, the only substantive difference is to put in the Regulatory Guidance the information from the Generic Letter that basically says you do need to provide assurance that you have in place the agreements with the offsite grid operator such that contingencies out in the grid how they affect you, you are aware of them, and contingencies in your power plant how they

may affect the grid are communicated. That's a difference that I do see.

CHAIRMAN SIEBER: There is another aspect to that that I think is my own personal opinion. I think different grid operators do different things.

Again, there is no risk information but they can look at things like stability, power factor, degradation, the chance of losing additional units which can cause the whole system to crumble. Or their system operator willingness to shed non-essential loads to save the rest of the system. If you know --

MEMBER STETKAR: And they know that.

CHAIRMAN SIEBER: -- the Northeast blackout, PJM was not a part of that. There's a bunch of nuclear reviews on the PJM systems. On the other hand, they are very solidly connected to their northern power group. In my judgment one system operator did a little better than another one in making the quick decisions that's necessary in a deteriorating grid situation.

I don't think agreements and analysis and that kind of stuff can overcome some of these emergent operating issues. I don't have the world's greatest faith in the ability to rely totally on system operator's risk analysis.

As I recall, to run -- and it's been a while, you know. I'm back in old computer days when it took several hours to do a stability run. I don't know whether you can do that in a very rapid fashion but in the days when I worked with it, it took a while in order to be able to determine whether the system was stable or not.

I think that there has to be some margin in there that the plants will protect themselves if necessary and make sure that they are in pretty good shape.

I wouldn't place 100 percent faith on the instant ability of the most skilful operation of a system. It's very complex and has a lot of self-initiating devices in there that will take action away from the operator to do it.

Sam, would you like to comment first on whether we ought to issue a memo, yes or no?

MEMBER BROWN: By memo you still mean just a memo --

CHAIRMAN SIEBER: We don't issue it.

MEMBER ARMIJO: Basically the question the way I understand it is should the full committee hear this presentation and should we issue a memo.

CHAIRMAN SIEBER: Yes.

MEMBER ARMIJO: I think this is not my area. There are people with a lot more -- that no this area, yourself and John, Dennis, Charlie. There is a divergence of opinion and unless we are -- and so I think with that much divergence I would say the full committee ought to hear it.

CHAIRMAN SIEBER: Okay. Well, you know, from what I've heard so far even though we come up with different answers, the opinion is not that divergent. I think we all sort of know what's going on.

MEMBER ARMIJO: What I'm trying to say is that unless we want to recommend significant changes in the Reg Guide defer the issuance of the Reg Guide. Normally I would not recommend the full committee hearing it but it sounds like there's some significant changes that John or yourself see that is needed. I'll leave it at that. There are people who know a hell of a lot more about this than I do so I want to put it through the whole committee.

CHAIRMAN SIEBER: The other consideration is if we right a letter and say you ought to risk inform this and make all these changes, how many years will it be until --

MEMBER ARMIJO: That's a point. Some of

the things we're talking about it gets into regulatory space rather than a Regulatory Guide. The rules ought to be strengthened so I don't know.

CHAIRMAN SIEBER: I don't know the answer to this for sure but I think everybody has Tech Specs to tell them when to do what. The Regulatory Guide really doesn't do much.

Dennis.

MEMBER BLEY: Except for a couple of things I would go with just a memo, but the couple of things I think could be important. I would like to see us write a letter on this because I think it's a significant Reg Guide. The way it lays out the seven cases is important to speak on from our point of view.

I might agree with John if I understand what he's saying, but I do agree with the concept that the LCOs belong in the Tech Specs where they can get handled. They ought to be referred to here. Maybe we want to say something about later doing something towards the lines of what Jack said.

I would recommend getting this out very soon with only a few minor things maybe being done to it. I think it links to other work we're involved in and we probably need to speak on this and later we'll probably connect it with other things we're doing by

some of our other larger committees, subcommittees. I would go for a letter but I think it might have some recommendations for the future in it to complement this current document.

CHAIRMAN SIEBER: Mike.

MEMBER RYAN: I defer to Dennis and Sam and John and others that are more expert on this than I am. I was pleased to hear the clarification about the underground cables and wetting versus submerge and those kind of issues. This is the first Reg. Guide.

MEMBER STETKAR: This is the first one. The one that you weren't here for. We're going to go back to the second one.

MEMBER RYAN: Never mind. Thank you.

CHAIRMAN SIEBER: You'll get your turn in another 12 minutes.

MEMBER STETKAR: You can go first on 1.218.

CHAIRMAN SIEBER: That's not a bad idea. The criteria for your response is the same as it was for 1.93 which is should we send a memo that says issue it now, you know, it's okay with us. Or, if not, then the full committee should hear it. If you are recommending the full committee hear it, then what are the issues that you think we need to focus our

attention on.

MEMBER RYAN: Again, my interest in the second Reg Guide was a very narrow one on the wetted cables and the underground and submerged cables and how they age perhaps differently than other cables and how they behave in failure modes versus operational modes and so on. I guess the fact that has been addressed satisfies me. Like I say, it's not my area of expertise in the broader picture so if others think it needs a letter, that's fine by me.

CHAIRMAN SIEBER: You think a memo telling them to issue --

MEMBER RYAN: In my narrow range of interest in the topic that would satisfy me.

CHAIRMAN SIEBER: Okay.

Dennis.

MEMBER BLEY: We've written letters while unrelated aspects closely related to this Reg Guide several times in the last few years. I would like to see us attempt to write a short letter on this one agreeing with it, recommending it be published. I think we ought to speak on it.

CHAIRMAN SIEBER: Okay. Could you tell us what areas we should speak on?

MEMBER BLEY: I think we should speak to

its value. I think we should speak to its catalogue. I think we should promptly say that we think -- we would like somewhere to see some guidance on how to look at an ensemble program that uses these things. Not that it belongs in here but I've heard the stories of how it's done.

It sounds pretty good. It sounds very diffuse and I'm not sure if I were a reviewer, and maybe if I were a reviewer I'd have enough understanding of the diverse ways this is handled that it wouldn't be a problem for me. As a guy sitting here it's not completely clear.

CHAIRMAN SIEBER: Okay.

Sam.

MEMBER ARMIJO: I think this Regulatory Guide is ready to go. I think a memo would be just fine.

CHAIRMAN SIEBER: Okay. I will offer my own opinion at this time. I also think a memo would probably be appropriate. If there is a weakness, I would say the weakness is not enough attention to the details of what the tests are and what they accomplish were there to be a flood.

Now, maybe this Reg Guide isn't the place for that. Maybe a code or a standard is the place for

that. I'm not aware that there are codes and standards other than instructions as to how to do some of these tests and what they mean.

John.

MEMBER STETKAR: I'm really torn. I think I tend to agree with Dennis' opinion that this has been -- this topic has been a visible element of our letters on several license renewal applications.

I think that the committee's issuing a letter with regard to this Regulatory Guidance is probably an appropriate -- I'm not trying to prejudice anything -- an appropriate element of closure of that topic rather than just simply a memo saying go forth and prosper. I think in that sense a short letter would be appropriate.

CHAIRMAN SIEBER: You sound like a volunteer.

MEMBER STETKAR: I said I was following Dennis's opinion.

(Laughter)

CHAIRMAN SIEBER: We have two volunteers. Write that down.

Charlie.

MEMBER BROWN: I think a memo is satisfactory for the circumstance. This is a

relatively narrow Reg Guide which effectively just talks about available techniques for doing testing. It does not really establish a broad range program.

I amplifies or kind of answers a question that we had asked in previous meetings about how do you go about doing this testing and what are the available methodologies and that is fundamentally a catalogue of methodologies. You can argue whether you can add one or subtract one or maybe a combination but I just think a memo would be satisfactory and let it go ahead and go out.

CHAIRMAN SIEBER: Okay.

Joy.

MEMBER REMPE: Well, I'm going to go with taking it to the full committee because, again, it would come back to us in a month as a subcommittee with some modifications to address a bit more explicitly what is considered an adequate number of tables and adequacy of the program selected.

Even if it's referring to other guidance I would be happier with it but I just don't see -- if you issue a memo you don't have that opportunity. I'm hoping if we do go to a full committee when it comes back to us that there will be some amplification in the discussion.

CHAIRMAN SIEBER: Okay. Well, I would like to thank all the members for their opinion and also the staff for their presentations and for all the work that has gone into this. I'm impressed by the over 30 years of work on the first one. I think of the two the 1.218 is a little simpler but it is, I think, needed.

I think simpler is always in the eye of the beholder, however, but it has the same kinds of threads in it in timing and techniques as other kinds of ISI programs. All of them have the same general format. This will not be a surprise to the licensees and it certainly is not a surprise to me.

What I understand from the data, even though I would have arranged it a little bit differently on my own, I think that the conclusions that the staff draws match fairly well with the data. You have to ask yourself is it worth the effort to get the data in a perfect kind of shape that illustrates it even better when you can deduce that from the data that we already have and the way it's presented.

I think what I will do at the full committee meeting is to go through these issues and how we felt, keeping the Reg Guide separate. Therefore, the full committee will decide whether they

want to hear it or not, even though for this meeting we have probably a majority.

So I would like to thank the staff. I don't know if our telephone participants are still there but I would like to thank you for your input. I would also like to thank Christina for her preparatory work and also the members for your attention and your honest opinions.

With that, I would like to adjourn the meeting.

(Whereupon, at 4:44 p.m. the meeting was adjourned.)

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Regulatory Guide 1.218: Condition-Monitoring Techniques For Electric Cables Used In Nuclear Power Plants

ACRS Briefing Meeting: September 7, 2011

Darrell Murdock
Division of Engineering
Office of Nuclear Regulatory Research

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PURPOSE

- To provide the essential elements of a condition monitoring program and a list of condition monitoring techniques.
- This Regulatory Guide was generated in response to industry's request for guidance on condition monitoring techniques that the staff finds acceptable
- Regulatory Guide applies to all cables within the scope of 10 CFR 50.65 (The Maintenance Rule).

BACKGROUND

- *Operating Experience*
  - Number of Cable failures show an increasing trend with plant age.
  - Cable failures have resulted in:
    - Plant Transients and Shutdowns
    - Lost of Safety Functions and Redundancy
    - Entries into Limiting Condition for Operation
    - Challenges to Plant Operators
  - NRC Issued Documentation Regarding Cable Failures
    - IN 89-63 Possible Submergence of Electrical Circuits Located Above the Flood Level
    - IN 2002-12 Submerged Safety Related Electrical Cables
    - GL 2007-01 Inaccessible or Underground Power Cable Failures that Disable Accident Mitigating Systems or Cause Plant Transients
    - IN 2010-26 Submerged Electrical Cables

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BACKGROUND (Continued)

- The increasing trend in cable failures gave greater importance to the need for condition monitoring to ensure operational readiness of cables relied upon for accident mitigation and avoiding unnecessary operational transients.

- As a result of Licensees response to Generic Letter 2007-01, the staff identified approximately 200 records of failed or degraded cables.

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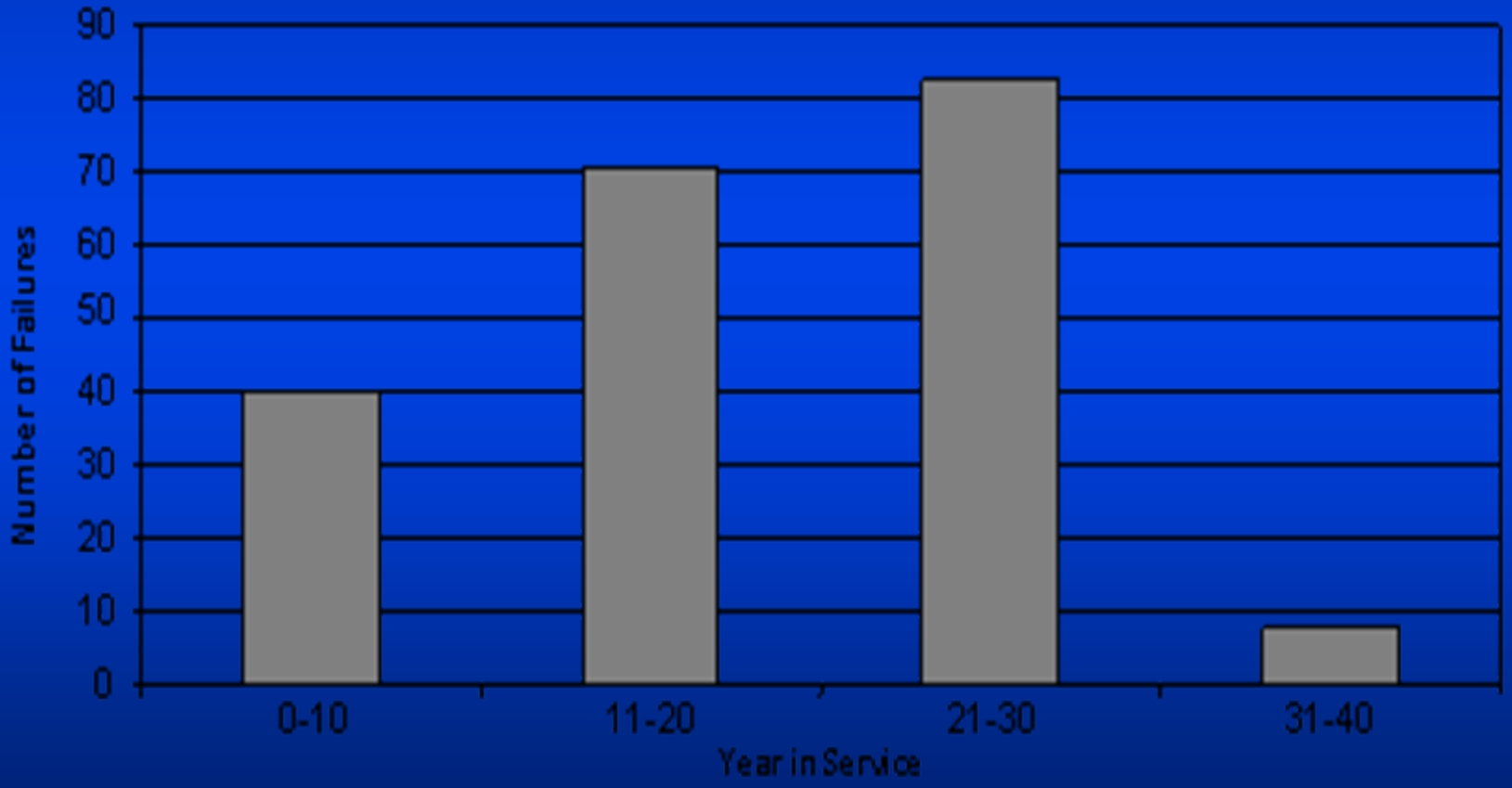
BACKGROUND (Continued)

United States Data (Generic Letter 2007-01)



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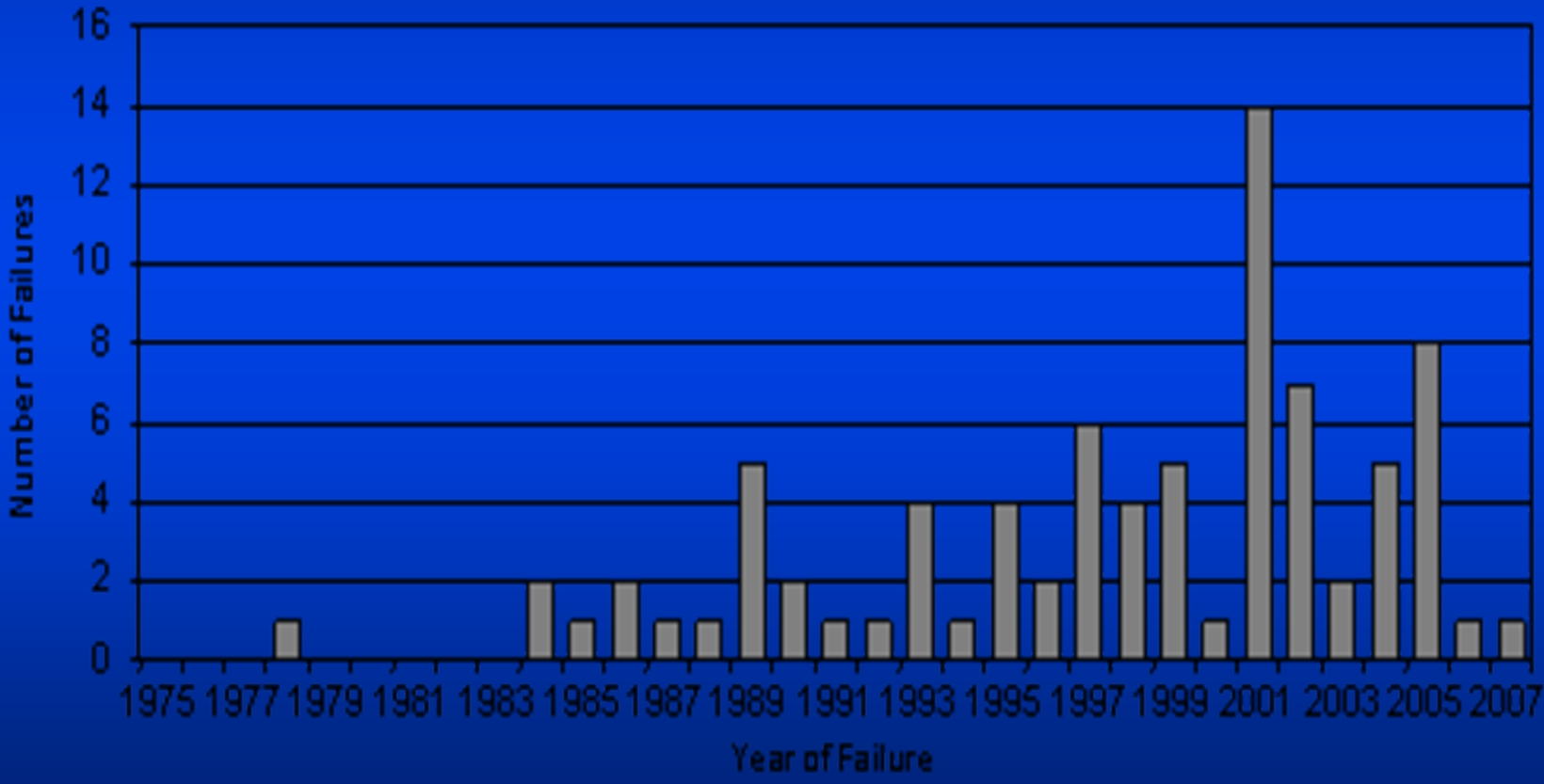
BACKGROUND (Continued)

United States Data (Generic Letter 2007-01)



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BACKGROUND (Continued)

- The condition monitoring techniques chosen by licensees should be based on plant-specific installations, applications, operating conditions and operating experience

- Condition monitoring of cables may be limited to a representative sample of cables

- Frequency of condition monitoring may be adjusted based on demonstrated plant specific cable test results and operating experience.

- List of Commonly Used Condition Monitoring techniques included are:
  - Very Low frequency Test
  - Visual Inspection
  - Dielectric Loss-Dissipation Factor (Power Factor or tan delta)
  - Partial Discharge Test
  - Time Domain Reflectometry

GENERIC AGING LESSONS LEARNED (GALL)

- Aging Management Programs X1.E1, X1.E2, and X1.E3 address cables condition monitoring.

- XI.E3 INACCESSIBLE POWER CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

- **Detection of Aging Effects**

  The first tests for license renewal are to be completed prior to the period of extended operation with subsequent test performed at least every 6 years thereafter.

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NUREG/CR – 7000 (Essential Elements of an Electric Cable Condition Monitoring Program)

- NUREG/CR-7000 list the essential elements for an effective cable condition monitoring program, industry guidance and standards, and the experience and observations of others who have studied or conducted electric cable condition monitoring and qualification testing.

- The program methodology presented in NUREG/CR 7000 provide guidance on the following technical aspects:
  1. selection of cables to be included in the program,
  2. characterization and monitoring of cable operating environments and stressors,
  3. selection of the most effective and practical condition monitoring techniques,
  4. documentation and review of cable condition monitoring testing and inspection results,
  5. periodic review and assessment of cable condition and operating environments.

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REGULATORY GUIDE 1.218 REGULATORY POSITIONS

I. Elements of an acceptable Condition Monitoring Program:

a) Select cables to be monitored.
b) Develop database for monitored cables.
c) Characterize and monitor service environments.
d) Identify stressors and expected aging mechanisms.
e) Select condition-monitoring techniques suitable to monitored cables.
f) Establish baseline condition of monitored cables.
g) Identify cable characteristics and aging effects being monitored by each selected condition-monitoring technique.
h) Perform test and inspection activities for periodic condition monitoring of cables.
i) Periodically review and incorporate plant and industry experience.
j) Periodically review, assess, and trend the condition of monitored cables.
k) Identify degraded conditions and take prompt corrective actions.

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REGULATORY GUIDE 1.218
REGULATORY POSITION (Continued)

II. The NRC staff considers the use of appropriately selected combinations of typical cable condition-monitoring techniques, to be an acceptable method for satisfying the regulations to assess the continuity of the systems and the conditions of their components. The condition monitoring techniques selected should be based on plant-specific design, installation, and operating conditions and operating experience related to the cables used in nuclear plants.

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REGULATORY GUIDE 1.218
REGULATORY POSITION (Continued)

III. Cable condition monitoring should be augmented under these conditions for selected cables when the facility has:

1. Experienced failure of cables connected to critical equipment
2. Operational history indicates failure of cables
3. There is a locally adverse operating environment
4. Industry operating experience with similar conditions and equipment configuration to those at the licensed facility indicate a need for augmented monitoring

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PUBLIC COMMENTS

- The DG-1240 was issued for public comments on June 13, 2010, and the comment period expired on August 13, 2010

- A large number of the public comments received pertain to weaknesses associated with a number of condition monitoring techniques. The staff responded to these comments by modifying the discussion of the condition monitoring technique as appropriate.

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SUMMARY

- Regulatory Guide 1.218 provides guidance on the essential elements of a condition monitoring program and a list of condition monitoring techniques that the NRC staff finds acceptable.

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SUMMARY

QUESTIONS?

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Regulatory Guide 1.93
Availability of Electric Power Sources

ACRS Subcommittee Meeting
September 7, 2011

Sheila Ray
Division of Engineering
Office of Nuclear Regulatory Research

Regulatory Guide 1.93

Background

- Regulatory Guide (RG) 1.93, Rev. 0 was issued in December 1974.
  - Limiting Conditions for Operation (LCOs) Actions and Completion Times were incorporated into the Standard Technical Specifications (STS) (NUREG 1430-1434)

- RG 1.93 was revised for the following reasons:
  - To incorporate lessons learned from the 2003 Northeast Blackout and Generic Letter (GL) 2006-02, “Grid reliability and the impact on plant risk and the operability of offsite power.”
  - To address the impact of deregulation and its influence on offsite power
  - To include information regarding passive reactors

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Background

- On August 14, 2003, the largest power outage in U.S. history occurred in the Northeastern United States and parts of Canada.

– Nine U.S. NPPs tripped. Eight of these lost offsite power, along with one NPP that was already shut down.
– The length of time until power was available to the switchyard ranged from approximately one hour to six and one half hours.
– Although the onsite emergency diesel generators (EDGs) functioned to maintain safe shutdown conditions, this event was significant in terms of the number of plants affected and the duration of the power outage.

Regulatory Guide 1.93

Background

- Generic Letter (GL) 2006-02, “Grid reliability and the impact on plant risk and the operability of offsite power”

– The staff identified issues as a result of considering the August 14, 2003, blackout event.
– The staff was concerned that several conditions associated with assurance of grid reliability may impact public health and safety and/or compliance with applicable regulations.

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Background

- Issues considered in GL 2006-02, as a result of the August 14, 2003 blackout:
  - use of long-term periodic grid studies and informal communication arrangements to monitor real-time grid operability,
    - the use of transmission load flow analysis tools (analysis tools) by TSOs to assist NPPs in monitoring grid conditions to determine the operability of offsite power systems under plant technical specifications (TSs)
    - use of protocols between the nuclear power plant (NPP) and the transmission system operator (TSO), independent system operator (ISO), or reliability coordinator/authority (RC/RA)
  - potential shortcomings in grid reliability evaluations performed as part of maintenance risk assessments,
    - use of NPP/TSO protocols and analysis tools by TSOs to assist NPPs in monitoring grid conditions for consideration in maintenance risk assessments
  - lack of preestablished arrangements identifying local grid power sources and transmission paths
    - offsite power restoration procedures in accordance with Section 2 of NRC Regulatory Guide (RG) 1.155, “Station Blackout”

Regulatory Guide 1.93

Background

- Staff began revising RG 1.93 to clarify the staff position for acceptable operating procedures and restrictions if the available electric power sources are less than the limiting conditions for operation (LCO).
- DG-1244 was issued in September 2010 for public comment.

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Regulatory Guide 1.93

Scope

- Applicable to single and multiple unit plants
- Consistent with STS

Regulatory Guide 1.93

Regulatory Basis

- General Design Criterion 17, “Electric Power Systems” requires:
  - Two physically independent circuits shall supply electric power from the offsite transmission network to the onsite electric distribution system. Each of these circuits shall be designed to be available in sufficient time following a loss of all onsite alternating current (ac) power supplies and the other offsite electric power circuits. One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident.
  - The licensee shall provide redundant onsite ac power supplies.
  - The licensee shall provide redundant onsite direct current (dc) power supplies.
  - An onsite electric power system and offsite electric power system shall be provided to permit functioning of structures, systems, and components (SSCs) important to safety. The safety function of each system (assuming the other system is not functioning) shall provide sufficient capacity and capability to ensure that (1) specified fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated design-basis events.

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GDC 17

- Design Criteria for onsite and offsite electrical power systems
- For NPPs not licensed in accordance with GDC in Appendix A of 10 CFR Part 50, the applicable design criteria are provided in the updated final safety analysis report.
  - Added to RG 1.93, Rev 1

Regulatory Guide 1.93

Revisions to Rev. 1 – Part B, Discussion

- Grid-Risk-Sensitive Maintenance
  - Grid reliability evaluations should be performed as part of maintenance risk assessment, as required by 10 CFR 50.65(a)(4), “Maintenance Rule”
  - If degraded grid reliability conditions exist or are forecasted to exist, during maintenance activities, licensees should consider rescheduling such activities to limit the risk.
  - If there is an overriding need to perform the maintenance, licensee should consider alternate equipment protection measures and compensatory actions to minimize the risk.

Regulatory Guide 1.93

Revisions to Rev. 1 – Part B, Discussion

- Communication with TSO
  - Allows NPP operator to understand changes in the grid that can affect plant operations and the operability of the plant's offsite power system
  - Enables NPP operator to obtain up-to-date information on existing and projected grid conditions to maintain a current and valid risk assessment and manage possibly changing risk

Regulatory Guide 1.93

Revisions to Rev. 1 – Part B, Discussion

- Passive Plant Designs
  - May not require multiple power sources since passive safety-related systems are used for core cooling and containment integrity
  - If offsite power is not available, nonsafety-related diesel generators should be available for plant functions.
  - If offsite power or a diesel generator is inoperable, the licensees should make every effort to restore one of them within a reasonable time frame.

Regulatory Guide 1.93

Revisions to Rev. 1 – Part B, Discussion

- Operational Restrictions

1. Meeting the LCO
   - Rev 0 – when all electric power sources required by GDC 17 are available
   - Rev 1 – when all LCO-required electric power sources are determined to be operable in accordance with TS, at required voltage and capacity as well as capable of withstanding N-1 contingency

Revisions to Rev. 1 – Part B, Discussion

- Operational Restrictions

2. Period of Continued Operation
   - Rev 1 includes conditions during loss of required electric sources that operation at power can continue for a limited time, not to exceed completion time per TS rather than implement an immediate shutdown
   - Decisions should be based on evaluation of safety significance
     - Prevent further degradation of electric power system or jeopardize plant safety
   - Continue operation at power
     - Use period of continued operation to restore power sources and prepare for orderly shutdown
   - Immediate Shutdown
     - Commence shutdown in parallel with efforts to restore inoperable power sources

Regulatory Guide 1.93

Revisions to Rev. 1 – Part B, Discussion

- Operational Restrictions

3. Orderly Shutdown
   - Rev 1 allows for termination of the shutdown and return to rated power if the TS LCO is restored during the shutdown
   - Rev 1 added a caution that if grid conditions worsen, a manual or automatic trip is desirable.
   - If compliance with TS LCO not restored within completion time, initiate orderly shutdown
   - Licensee should take all actions to improve the inoperable or degraded condition, if the resources are available

Regulatory Guide 1.93

Revisions to Rev. 1 – Part B, Discussion

- Levels of Power System Degradation
  - Rev 0 defines 5 scenarios and Rev 1 defines 7 scenarios

Number of Sources Less than LCO	
Rev 0	Rev 1
One AC power source	One Offsite AC power source
	One Onsite AC power source
Two Offsite AC power sources	Two Offsite AC power sources
One Offsite and One Onsite AC power sources	One Offsite and One Onsite AC power sources
Two Onsite AC power sources	Two Onsite AC power sources
One Onsite DC supply	One Onsite DC power source
	One Inverter

Regulatory Guide 1.93

Regulatory Positions

- To ensure that NPP is in safe operating mode whenever the available electric power sources are less than TS LCO.
- Continued power operation contingent on TS and the following:
  - Reliability, availability, and capability of remaining sources
  - Required maintenance activities does not further degrade the power system or jeopardize plant safety
  - Continued compliance with required actions in TS
- New to Rev 1:
  - If there is any inconsistency between RG and TS, the TS shall be used
  - Coordination between NPP operators and transmission entities
  - Accuracy and conservatism of post-trip voltages predicted by online grid analysis tools should be determined after each actual trip

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Scenario 1: Available Offsite AC Power Sources are one less than LCO

- Offsite Power system has no redundancy
- Risk associated with loss of offsite power is compounded by:
  - Ability to quickly restore offsite sources would be lost
  - Remaining offsite circuit could be susceptible to the same cause
  - Consequential trip probability of a number of generating units would be higher.
  - Availability and capability of offsite power system could be affected
- Potential common cause failure, as a result of fire, ice storm, or similar event

- Regulatory Position
- Power operation may continue up to 72 hours, provided that subsequent single failure would not cause total loss of offsite power
- Otherwise, shut down in accordance with TS

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Scenario 2: Available Onsite AC Power Sources are one less than LCO

- Loss of redundancy of onsite power source to mitigate effects of an event
- One emergency diesel generator (EDG) is inoperable or available onsite supply does not have sufficient capacity
- GDC 17 intent (added to Rev 1):
  - Avoid risk associated with immediate shutdown
  - Minimize risk by limiting exposure time

- Regulatory Position
  - Power operation may continue up to 72 hours, provided that redundant EDG is tested/assessed within 24 hours to be free from common-cause failure or verified operable per TS
  - Otherwise, shut down in accordance with TS

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Scenario 3: Available Offsite AC Power Sources are two less than LCO

- Offsite power system is not available or has inadequate capability
- Onsite AC system remains available and is not degraded

- Regulatory Position

- Power operation may continue up to 24 hours if it appears likely that at least one of the offsite sources can be restored within 24 hours
- If one offsite source is recovered within 24 hours, power operation may continue and not exceed 72 hours, as per Level 1
  - If no offsite source is restored within the first 24 hours, within 6 hours bring unit to hot shutdown for BWR (Mode 3) and hot standby for PWR (Mode 3) or as specified in TS

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Scenario 4: Available Offsite and Onsite AC Power Sources are each one less than LCO

- Loss of individual redundancy in both offsite and onsite AC power sources
- Susceptibility of power system to single bus or switching failure could cause all emergency power to be unavailable

- Regulatory Position
  - Power operation may continue up to 12 hours if it appears likely that at least one of the affected sources can be restored within 12 hours and the grid capacity and voltage are such that a subsequent single failure would not cause a loss of offsite power
  - If either source is recovered within 12 hours, power operation may continue and not exceed 72 hours, as per Level 1 or 2
    - If no source is restored within the first 12 hours, the unit should be shutdown

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Scenario 5: Available Onsite AC Power Sources are two less than LCO

- Two EDGs inoperable or insufficient capacity to mitigate the effects of an event in one unit and safely shutdown other units
- Licensees should evaluate the risk associated with continued operation and immediate shutdown (grid instability and LOOP)
- Coordinate with TSO to accommodate plant shutdown

• Regulatory Position

- Power operation may continue up to 2 hours
- If only one onsite AC source is recovered within 2 hours, power operation may continue and not exceed 72 hours, as per Level 2
  - If no source is restored within the first 2 hours, the unit should be shutdown per TS

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Scenario 6: Available Onsite DC Power Sources are one less than LCO

- Available DC power sources do not have required redundancy
- Subsequent degradation in onsite AC or DC system could jeopardize plant safety
- Passive designs depend heavily on DC power systems – 72 hour batteries; licensee should critically monitor required functions

- Regulatory Position
  - Power operation may continue up to 2 hours
  - If affected DC source is restored, unrestricted operation may resume
    - If not, shutdown the unit per TS
  - Licensee should monitor required functions and take necessary actions (cross connect a supply or shed optional load) to ensure safe shutdown

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Scenario 7: Available Inverters are one less than LCO

- Available inverters do not have required redundancy
- Subsequent single failure of another inverter could cause a reactor trip

- Regulatory Position
  - Power operation may continue not to exceed the 24 hour time period specified in the TS
  - If affected inverter is restored, unrestricted operation may resume
    - If not, shutdown the unit per TS

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Response To Public Comments

- Received comment letters from 4 organizations
- 6 comments on Section D (Implementation)
- “Offsite Power System” is used in this RG and is consistent with GDC 17. “Grid” is not within the scope of TS
- To address plants that may vary with STS, the following was added in Part C (Regulatory Position):
  - “If there is any inconsistency with respect to completion times between this regulatory guide and the plant-specific technical specifications, the plant-specific technical specification should be used.”

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Response To Public Comments

- Revision in Section C (Regulatory Position)
  - "The accuracy and conservatism of the post-trip voltages predicted by the online grid analysis tool should be determined after each actual trip."
- Revision in Section C, Regulatory Position 1
  - "If the available offsite ac power sources are one less than the LCO, power operation may continue for a period that should not exceed 72 hours if the electric grid system capacity and voltage are such that a subsequent single failure would not cause a total loss of offsite power. Subsequent single failure to be considered is a trip of the unit's generator and related offsite power failures (e.g., ice storm, forest fire, etc.)."

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