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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

DIGITAL INSTRUMENTATION AND CONTROL SYSTEMS

SUBCOMMITTEE

+ + + + +

WEDNESDAY, MAY 17, 2017

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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 8:33 a.m., Charles H. Brown, Jr., Chairman, presiding.

COMMITTEE MEMBERS:

CHARLES H. BROWN, JR., Chairman

DENNIS C. BLEY, Member

JOSE MARCH-LEUBA, Member

JOHN W. STETKAR, Member

MATTHEW W. SUNSERI, Member

DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU

ACRS CONSULTANT:

MYRON HECHT

ALSO PRESENT:

KATI AUSTGEN, NEI

NEIL ARCHAMBO, Duke Energy

ROBERT CALDWELL, NRO

JOHN CONNELLY, Exelon

NORBERT CARTE, NRR

BERNARD DITTMAN, RES

JASON DRAKE, NRR

VICTOR FREGONESE, NEI

STEVE GEIER, NEI

MAURICIO GUTIERREZ, RES

GREG KRUEGER, NEI

JOHN LUBINSKI, NRR

WENDELL MORTON, NRO

DEAN MUNDY, NEI

DAVID RAHN, NRR

JASON REMER, NEI

KEN SCAROLA, Public Participant*

DINESH TANEJA, NRO

BRIAN THOMAS, RES

ANDREA D. VEIL, Executive Director, ACRS

*Present via telephone

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P R O C E E D I N G S

8:33 a.m.

CHAIRMAN BROWN: Okay, we've got all the panelists up. The meeting will now come to order. This is a meeting of the Digital Instrumentation and Control Subcommittee. I am Charles Brown, Chairman of the subcommittee meeting.

ACRS members in attendance are Matt Sunseri, Dennis Bley, John Stetkar, Jose March-Leuba, and our consultant, Myron Hecht. Christina Antonescu of the ACRS staff is the designated federal official for this meeting.

The purpose of this meeting is for the staff to brief the subcommittee on the Digital I&C Integrated Action Plan Rev. 1 and the current efforts to address common cause failure and 50.59 process for digital I&C upgrades.

Also, the subcommittee will receive a briefing from the Nuclear Energy Institute and industry's perspective on the Digital I&C Maintenance Initiative.

The ACRS was established by statute and is governed by the Federal Advisory Committee Act, FACA. That means that the committee can only speak through its published letter reports. We hold meetings to

gather information to support our deliberations. Interested parties who wish to provide comments can contact our offices requesting time after the meeting. Federal Register notice is published.

That said, we also set aside ten minutes for spur of the moment comments from members of the public attending or listening to our meeting. Written comments are also welcome.

The ACRS section of the U.S. NRC public website provides our charter, bylaws, letter reports, and full transcripts of all full and subcommittee meetings, including all slides presented at the meetings.

Just to emphasize this point -- and this is not in the written part -- members will be making comments during this meeting and those comments will be taken as their comments. They do not represent the full committee consensus but they will voice their observations, and/or questions, and/or suggestions, as I would refer to them and they should be taken in that light.

The ACRS Section of the U.S. NRC public -- oh, I already said that.

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

As always, we have one bridge line established for interested members of the public to listen in. Also, the bridge line will be open at the end of the meeting to see if anyone listening would like to make any comments.

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.

And also, please silence all cell phones, pagers, iPhones, iPads, and all appropriate appliances. Thank you.

We will now proceed with the meeting and I will call upon Mr. John Lubinski, Director in the Division of Engineering, DE, in the Office of Nuclear Regulatory Reactor Regulation, to start the presentation.

John.

MR. LUBINSKI: Thank you Charlie, I appreciate it.

Before I start, as you said, I'm the Director of the Division of Engineering in NRR. I am also the chair of the NRC's Internal Digital Instrumentation and Control Steering Committee. Other members of the Steering Committee, two of them are with me today, Brian Thomas, who is the Director of the Division of Engineering and Research and Bob Caldwell, who is the Acting Director of the Division of Engineering and NRO.

We also have NMSS and NSIR representatives, ad hoc members, and also OGC is an ad hoc members as well of the Steering Committee because many of the things we're talking about go beyond technical or are in the regulatory area.

So with those introductions, I would also like to thank the subcommittee today for providing an opportunity for us to update you on our activities.

We last briefed the subcommittee in our activities about a year ago and, at that point, the Integrated Action Plan had not yet been formally provided to the Commission. It was in the process of being provided. Since that time, it has been provided to the Commission. The Commission has approved the actions and we've actually updated the plan since then as well. So, you will hear about those updates.

This is an informational briefing today. We are not requesting approval of the committee or a letter on any of the activities that we are doing. We don't believe any of the activities, at this point, are ripe for such a discussion but, as part of our discussions today, we will talk about activities where we will be reengaging the committee, looking for insights, whether it is on technical issues or potential policy issues. We do believe there may be some policy issues down the road with respect to how we handle I&C and maybe some technical issues as well, when we start to get into the common cause failure.

As I said, this is an informational briefing today. A lot of it will be discussion of the Action Plan itself, status, priorities, and why we chose those priorities. We do have the scheduled meeting for all day. We're not sure if we have enough

information to fill the entire day from that standpoint, but we are here available all day to answer any and all questions that you have.

One of the things you will hear today from the standpoint of milestones is our next key milestone that actually has some, I will say, results, regulatory action is issuance of a RIS that provides information on how the industry can have certainty with respect to simpler Digital I&C upgrades to do it under 50.59. When I say simpler, we are talking things like controls on chillers, where they will be upgrading from an analog to a digital control on chillers and the industry is looking for some certainty there.

With respect to that, in the second half of our discussion, after NEI's presentation, we will be talking details on what is included in that RIS and it is a follow-up to a previous RIS that was issued. And that's one of the big near-term milestones that we see.

And as I said, we will highlight, as we go through the other activities that we have. We have the four gentlemen at the table who are representing the four major activities that we have that are in the plan and they will be discussing, as part of their presentations, overall general schedules, as well as

details of when we would be reengaging with ACRS.

With that, what I would like to do is turn to Jason Drake, who is the project manager for our Integrated Action Plan. He will run through the beginning of the presentation and introduce the rest of the staff that will be presenting today.

CHAIRMAN BROWN: Okay. Can I make one observation, based on one of your comments near the end? The RIS, the 2017-xx, is that what you are referring to?

MR. LUBINSKI: Yes, sir.

CHAIRMAN BROWN: There already was a RIS issued in 2002, 2002-22, if my memory serves me correctly --

MR. LUBINSKI: Yes, sir.

CHAIRMAN BROWN: -- which had some specific words relative to -- similar to what you are talking about in this. I guess I wanted to understand, does this 2017 RIS replace or just supplement 2002?

MR. LUBINSKI: It is a supplement. It is not a replacement. The RIS in 2002 was an endorsement of NEI 01-01. What we are trying to look at in the RIS is just a subset of the activities that are covered by NEI 01-01 and provide additional clarity in a supplement with respect to that subset of activities.

This afternoon, Wendell and Dave Rahn will be discussing the content of that RIS and that scope but it is only a supplement, not a replacement.

CHAIRMAN BROWN: Okay. In that light, we don't have to do it now, I just want to prepare for this afternoon later, there are, after reading it, in the 2002 version, there are some fairly clear statements relative to reactor protection and engineered safeguard systems relative to we anticipate that those will have to come in for licensing amendment type stuff, more than likely. You don't say -- it's not the hammer down, you will but it is pretty specific.

Whereas, when you look at the 2017 version, that seems to have loosened up in terms of the perspective.

So I don't want to go through that now but I just want to be able to make sure we address the connection between the earlier one and the later one, relative to reactor -- not chillers, but reactor protection system and engineer safeguard systems.

MR. LUBINSKI: I appreciate that heads up and we will be able to discuss that as part of our presentation on the RIS this afternoon or it might fall into the morning.

CHAIRMAN BROWN: Okay, thank you very

much.

MR. LUBINSKI: Thank you.

CHAIRMAN BROWN: Okay, Jason.

MR. DRAKE: Good morning. Thank you to Chairman Brown and the members of the Digital I&C Subcommittee for allowing us to brief you today.

My name is Jason Drake, Project Manager in the Office of Nuclear Reactor Regulation, Division of Policy and Rulemaking.

Today I want to go through the Integrated Action Plan, the broad overview of the plan, the objectives therein, and some of the changes from Rev. 1 that were integrated this past March.

Thanks to John, he already introduced the members of the Steering Committee and identified some of our adjunct staff.

With me today I have the Working Group leads, MP 1 through 4, respectively, starting with Mauricio Gutierrez, Mr. Wendell Morton, Mr. Dinesh Taneja, and Mr. Bernard Dittman.

We will be going through their detailed presentations a little bit later in the slide set but if we have questions along the way, I'm sure you will make those known.

Discussion topics, this is just a broad

outline of what we will be hitting in the presentation. Each one of these has a corresponding slide that we will get to in a second.

So key messages: The staff is undertaking directives outlined in SRM-SECY-16-0070. It is to be noted, though, that staff has continued actions previous to the approval of the IAP under the direction of SRM-SECY-15-0106, which was approved in February -- on October 25, 2016 -- which excuse me, came out on February 25, 2016.

Staff activities on the IAP are focused on tactical and strategic objectives, tactical being those targeted concrete changes that lead to direct implementation of digital I&C upgrades. Some may require Commission interaction or address policy issues. And more on that when we get to MP 4, along with the strategic, those being philosophical changes, the broader regulatory structure changes, alignment with standard-setting committees, for example, IEEE standard-setting committees and international communities.

Notation here to the third bullet, industry is concerned that activities to date have not enabled implementable results, we will just note that the staff has put forth significant effort in dedicated

working groups, as well as targeted tagger teams to work on concentrated development efforts. Although there have been no concrete implementation or results to date, there has been steady system progress in line with the milestones set forth in the IAP with the external stakeholder input.

Staff development on the RIS and response to implementable events by summer 2017, as Chairman Brown alluded to earlier, is in progress, and that is the clarification and endorsement of NEI 01-01. And, again, we will talk about that in a detailed presentation later.

Last bullet here, and will be showcased in slides 8 and 9 is that frequent staff engagement in public workshops and meetings with industry and other external stakeholders to reach a common understanding of the digital I&C regulatory challenges, priorities and potential solutions to address them; that has been set forth and we are pretty regimented about having a minimum of two public meetings per month, at a minimum and whenever they are needed in order to have that clarity and conversation with our stakeholders.

So IAP strategy for digital I&C modernization: Our overarching objective here is modernize the digital I&C regulatory infrastructure

and that IAP provides direction towards development of that strategy to modernize the digital administration control regulatory infrastructure.

Revision 0 of the IAP was approved by SRM in October 25th, 2016. Revision 1 has been published on March 31st of 2017 and updated our strategy for engaging external stakeholders to reach common understanding of digital I&C challenges, priorities, and potential solutions to address them. Those are identified in each one of the MPs' specific plans, wherein we have a set of milestones, schedules, and dates, and targets to continue that continuous progress.

The plan considers broad context of digital I&C regulatory challenges. It includes related activities being pursued by the staff.

The plan has been revised using NRC staff external stakeholder input. For example, a public meeting prior to Rev. 1 on February 22nd to ensure we had full stakeholder input, public input, et cetera, before the Rev. 1 was published.

As a result of the regulatory challenges, the plan continues to provide frequent public stakeholder interactions. Again, that's going to be common theme and once we get to the slides 8 and 9, using

that as a framework, you'll see that we've had continued and steady interaction.

Again, reiterating as set forth in the SRM, the Senior Management Steering Committee oversees the resolution of digital I&C regulatory challenges within the plan and when the IAP is implemented and the modernization plans are accomplished, the staff will submit any recommended changes to NRC policies to the Commission.

Now, I have a couple of points here on tactical and strategic that we already hit and I'm going to allow Bernie to expand upon those in his MP 4 presentation.

So speaking about the SRM-SECY-16-0070, which approved the IAP, first we need to talk about -- yes, sure.

CHAIRMAN BROWN: Just as a calibration from you.

MR. DRAKE: Sure.

CHAIRMAN BROWN: I've tried to understand a little bit what you mean by tactical advice and strategic. I have got my own mental image and I know you're going to talk about these, I guess during the MP 4 discussions. But just from an overview standpoint, what is the difference between tactical and

strategic?

MR. DRAKE: I'm going to -- I would actually prefer to defer to Bernie to maybe answer that directly.

MR. DITTMAN: This is Bernie Dittman, NRC. The tactical is really focused on building industry confidence to pursue upgrades of digital in the shorter term. So specific impediments are going to be addressed and proved through activities where industry proposes or comes in with likely modifications so that we can evaluate the efficacy of the proposed new tactical guidance. So, that's really -- so it's like a -- as industry put it, they see it as an evolutionary rather than a revolutionary change to the regulatory infrastructure; where the strategic is going to take a broader look at the entire regulatory infrastructure and evaluate ways to promote longer term sustainable efficiencies.

CHAIRMAN BROWN: Okay. If I -- just let me calibrate myself a little bit. I think I understand that.

I view the tactical, those are actionable things that industry could do now, based on at least guidance that you all put out, I presume, via the RIS that you intend to issue later this year. Is that one

thing?

MR. DITTMAN: Right, that would be --

CHAIRMAN BROWN: And strategic is do we need rulemaking, do we need reg guides, do we need -- where do we need revisions in the general overall regulations, regulatory infrastructure. Have I got that right?

MR. DITTMAN: You've got it right. So we want to enable the Mod in the near-term and then planning out the finalization, how to formulate that into the permanent regulatory infrastructure is something that is going to crossover between 4A and 4B, depending on whether there is value to making an interim change or an intermediate change to guidance or they can work using the clarified guidance like the RIS that is being proposed.

CHAIRMAN BROWN: Okay, thank you very much.

MR. LUBINSKI: If I could add to that, John Lubinski. With respect to one of the specific issues that will fall into what we are looking at the tactical area at this point would be a revision to ISG-06, which is the guidance for a license amendment request.

Where Bernie was saying the light is not as bright as how far do you go with those modifications,

clearly, if you're looking at saying throw ISG-06 in the trash and start over again from a structure standpoint, now you're more into a strategic area.

But we do believe there will be a number of modifications made to ISG-06 that is going to give the industry confidence that, when they come in, any impediments that they see in the process of licensing would be addressed. And when I say impediments, I'm really looking not from the standpoint of safety issues but from the standpoint of an efficiency in the process.

CHAIRMAN BROWN: Okay, than you very much, John.

MR. DRAKE: Thank you.

Again, so before we talk about SECY-16 or SRM-SECY-16-0070, a brief discussion about SRM-SECY-15-0106 was issued on February 25th of 2016 directed the staff to develop an integrated strategy to provide the plan and propose implementation models to the Commission within 90 days.

As a response, SECY-16-0070 was issued on May 31, 2016 provided the IAP for Commission approval. Rev. 4 of SRM-SECY-16-0070 was then issued on October 25th, approving the IAP.

Within the guidelines of that SRM, it is required that we provide an annual update to the --

annual update per SECY paper due to the Commission and within that, we have semi-annual Commissioner Assistant briefs that are required to showcase our progress therein. The first brief here, for example, June 6, 2016, that was just following the submission of the SECY; the second briefing held on January 30, 2017; and our third brief is targeted for the week of June 26, 2017 and that's still in progress with the office.

Again, our bullet here and the SRM identifies that we will have frequent stakeholder interactions. We've talked about that. And the staff has determined that there are no policy issues ready for Commission consideration at this time. That's a key point in the SRM that came through is that identify any policy issues that are ripe for Commission consideration and there has been, to date, none identified.

Also, the Commission also provided high-level principles to the staff during the development of the actual plan and the final tenet considered during the implementation of the plan, the requirements and guidance should not pose any unnecessary impediment to advance the nuclear applications of digital technology or otherwise

request for information out of scope, or additional burden on the industry.

Moving on to current industry perspectives. You'll see here a couple of bulleted notes here about the interactions of the staff and industry. Some of the key accomplishments from industry to date, publication of EPRI CCF Guideline made available in July 2016, the submissions of NEI 96-07 Appendix D in April of 2016, and NEI 16-16 partial drafts, Draft 1 in December 2016 and, more recently, Draft 2 in May of 2017.

Overall, it's been a very positive experience. We have very open dialogue, interactions with industry, frequent meetings, and planning calls, et cetera. We have captured industry's views, again, through all those meetings, and also attending industry's working group meetings.

In addition, we did have two drop-ins, AT level drop-ins in December 2016 and January 2017 that identify just the overall perspective of progress, digital I&C modernization efforts, and talk about future planning.

So what is industry dissatisfied with? Industry is ready to make digital modifications but unable to do so, due to significant adverse economic

impacts. That translates into regulatory uncertainty being the key thing.

What does that look like? Cost, schedule, inspections, and interpretation of guidance with licensees. We'll see in 2013 we had NEI-01 formal comments issued by the staff. That was just to showcase some of the interpretation and inspection issues that were challenging us at the time.

Regulatory uncertainty prohibits/limits digital modifications even to SR support systems, ergo chillers, to improve efficiency. And the lack of results is causing industry to lose confidence in the near-term.

So in response, given all the positives, NRC has been responsive to industry needs. But for example, to the last bullet here, and, again, we'll talk about this further as the formation and development of the RIS, we have had significant interoffice and regional support during the development. We have held two public meetings during this development time frame, which is typically a ten-month process in RIS development we've truncated down to in about five months.

So, we're moving forward. It's been a very collaborative process and the gentlemen will get

further into that as we discuss the RIS.

MEMBER SUNSERI: As you move forward with your presentation today, does the Integrated Action Plan address these three issues?

MR. DRAKE: In broad framework, yes, because it identifies in each one of the MPs how we're going to achieve success on each one of the certain perspectives. In response to the last bullet, we have already identified key milestones reflective of the RIS and MP 1A's technical in their schedule, milestone schedule.

MEMBER SUNSERI: So is there anything in your opinion that is not being addressed that is of industry concern? You said in general it does but what areas might be lacking?

MR. LUBINSKI: Maybe I could address that. Number one, the industry will be talking later and they can give their perspectives on it.

I would say in agreeing where Jason is, our plan addresses each of these issues but to say we have full resolution of how they are going to be addressed is not there yet. And I would say the biggest area right now is what Bernie Dittman talked about earlier, is how much change is needed from the standpoint of a license amendment request and how far does it need to

go for the industry to have confidence to provide license amendments now for major upgrades of digital I&C systems. But the plan does address that we need to do that.

I would say maybe the timing and how much change is needed would be the next level of discussion with industry to reach alignment.

I believe on the rest, including, as Jason said, the last bullet, of having some near-term action we believe the supplement to the RIS helps to provide some clarity. It is really focused on those subset of systems that we can reach quick alignment on that we have certainty. Anything that's beyond that gets bumped into one of the other activities for I don't want say longer term but the next step in the process.

MEMBER BLEY: What I'd like to hear from everybody today, as we go through, is response to the following. Almost ten years ago, certainly seven or eight years ago, there was a whole series of working groups and ISIs that came out in this area. The working groups included industry and we heard a lot about how everything was so well-aligned. And apparently, it isn't quite working the way people had hoped.

And what I'd like to hear, and especially if you can hit some examples, what is going to be

different this time around. I mean there was all optimism back then and there is a lot of pessimism conveyed publicly and to other places than just here in most recent years.

MR. LUBINSKI: Thank you. I appreciate that. I will ask each of our member work group leads, as they discuss this afternoon or this morning, they can discuss how this builds on what was identified before.

But I will comment at a high level that I believe there were a lot of successes that came out of the previous activities. As we move forward, we continue to identify those successes and we're a learning organization and realize, at that point, as you start to get into the details, that additional improvements may be needed.

I think the biggest area, two areas, if I had to say, were the lessons learned is with respect to what is really needed on the simpler digital I&C modifications to allow them to be done under 50.59 because the industry, as a whole, the technology has continued to develop as well, when you are talking about imbedded digital devices and many of those activities and the fact that many of them are becoming more prevalent today. So that was part of what prompted

that.

And then from a licensing standpoint, what we've learned as we continued, more specifically, to go through the Diablo Canyon review and some of the challenges we saw along the way. And we'll talk about those as well.

MEMBER BLEY: Thanks.

MR. DRAKE: Okay, thank you.

Okay, so the time line identified in the next two pages is just an illustration of all of our interaction with industry and stakeholders. Some of the key ones identified here along the way are identified in yellow. So it's submission of Appendix D, SECY-16-0070 submission to the Commission, the CA Brief in June, the Commission approval of the IAP in October, and NEI-16-16 Draft 1 submission to NRC in December of 2016, the second CA Brief in January and, more recently, in the 16-16 Draft 2 submission for NRC review.

I also identified here that for the RIS supplement, we have a tabletop exercise identified on May 25th to look through some examples with industry, walk through our process to ensure certainty in its development and interpretations therein.

MEMBER BLEY: Are these set up examples or

are these real cases that you are going to work through the tabletop?

MR. DRAKE: Wendell.

MR. MORTON: For the workshop, we prepared the draft RIS framework and put that out to the industry. And industry is preparing the examples for us right now. We gave them the feedback that if you have projects or mods that are the shelf and they are ready to go and you can process them this year for outages. Please provide those as examples so we can work them through --

MEMBER BLEY: Okay, we haven't received any of that yet.

MR. MORTON: Not yet but we will.

MEMBER BLEY: Okay, thank you.

MR. DRAKE: Okay, moving on. I want to give a high-level overview of MPs 1 through 4 and then I'm going to pass along to each one of the respective working group leads to walk through in more detail the specific MPs.

MP 1, you see a focus statement here, development of guidance for using effective qualitative assessments of the likelihood of failures, use of defensive measures, bounding and coping analysis, and evaluation of NRC's existing positions

on protection of digital I&C components and systems against CCF.

NRC's current position on CCF is guided by SRM-SECY-93-087 and Standard Review Plan Branch Technical Position 7-19.

The IAP is subdivided into MPs numbers 1A, B, and C and that was done in the Revision 1 to the IAP and we will expand upon that in slide 12 of the presentation.

MP 2 is considering digital I&C in accordance with 10 CFR 50.59, the focus there being address the need for mutual clarity between the industry and NRC staff to ensure NRC guidance is being properly translated into industry actions while performing 10 CFR 50.59 evaluations of digital I&C upgrades.

So under existing guidance for 10 CFR 50.59, screening evaluation of digital I&C systems, there have been examples of licensees improperly performing or documenting the technical basis for 10 CFR 50.59 analyses for I&C modification using digital technologies. The industry stakeholders were hesitant, at the time, to pursue the deployment if I&C upgrades under 10 CFR 50.59 because of regulatory uncertainty, as we talked about earlier. And Wendell

will certainly expand upon that in the later slides and his independent presentation for Appendix D later in the afternoon.

CHAIRMAN BROWN: Before you go on, you are talking about MP 2.

MR. DRAKE: MP 2, yes.

CHAIRMAN BROWN: Are you going to talk about some examples of what the problems were when they submitted these? You said that you uncovered stuff after the fact, or there were some examples after the fact that they did some changes yet they were outside the box of what you all, that the NRC considered 50.59 covered.

MR. DRAKE: Wendell, do you want to answer that?

MR. MORTON: Sure.

CHAIRMAN BROWN: You don't have do it -- if you're going to cover it later, don't do it now. I'm just wondering do you have it. I don't want to interrupt the --

MR. MORTON: I was going to speak to that point because essentially there are two paths to where we got to, how we got to Appendix D.

So there was the 2013 letter that NRC sent out to NEI stating some of the concerns they have with

the current guidance. And then there is the inspection experiences that we had, as the staff, mutual to some experiences the licensees have had with the challenges of using the current guidance to license more digital upgrades under 50.59.

CHAIRMAN BROWN: Okay.

MR. MORTON: So those combined get us to this point. And I will get into that in more detail in my presentation.

CHAIRMAN BROWN: All right. I will task you, in this circumstance, to remind me to provide a heretical comment during your presentation, when you get there.

MR. MORTON: You mean to remind you to make a comment.

CHAIRMAN BROWN: Remind me. Hey, I'm so old that I'm not sure I'll remember this.

MEMBER BLEY: You'll get a measure on your measure.

CHAIRMAN BROWN: You young folks are much more able to retain this type of information. So I may need some help.

MR. MORTON: All right, I'll make a note to remind you.

CHAIRMAN BROWN: Thank you.

MR. DRAKE: Moving on to modernization plan number 3, acceptance of digital equipment focus: identify needed improvements to regulatory infrastructure to ensure the implementation of digital devices is being appropriately evaluated by licensees, applicants, and suppliers and all rolled up into compliance in regulations and policy.

This MP supports improving guidance for accepting commercial grade digital equipment, which is readily available; however, not designed in accordance with NRC quality assurance criteria per Appendix B, 10 CFR Part 50.

Dinesh has a lot of background on this. So he will expand upon this in MP 3.

MP 4, assessment for modernization of the instrument and control regulatory infrastructure, infrastructure meaning regulations and guidance focused on comprehensive modernization assessments to identify further improvements to the regulatory infrastructure and develop the plans for accomplishing such improvements.

Now, we saw earlier when talking about tactical, it is sequencing of actions that follow progress of MPs 1 through 3. And that's why it has been subdivided therein for tactical and 4B, strategic

modernization. Bernie has done an excellent job of breaking out those two MPs and he will expand upon that in his presentation.

MEMBER MARCH-LEUBA: I apologize because I am new in this and I haven't been following it for the last 15 years or something but I don't see anywhere in here risk-informed concepts. Are risk-informed concepts built into this study?

And let me give you an example just to clarify what I'm talking about. Imagine I am in a plant and I am going to buy a new pickup truck for the fleet. The pickup truck has digital controls on it but it obviously does not affect whatsoever the risk to the plant. So you can go ahead and buy your pickup truck but it does not affect the plant.

There are other components like maybe chillers, maybe air conditioning, maybe the lighting, which doesn't really affect the risk of the plant that much and you could just build a 50.59 case easily on that.

Has that been addressed?

MR. DRAKE: That's the 50.59 framework. Do you want to wait until we get to MP 2 or you -- well, I'll ask the committee. Is it okay if we maybe revisit this when we get to the MP 2 presentation?

MEMBER MARCH-LEUBA: Yes, it is for my education.

MR. MORTON: That might be better to answer that question during our risk presentation, specifically. That is where the question is targeting towards, or during the MP2, which is later this afternoon, too.

MEMBER MARCH-LEUBA: Just remind me to remind you.

(Laughter.)

MR. DRAKE: Okay. So moving forward, I'll turn it over to Mauricio Gutierrez for MP 1 discussion.

MR. GUTIERREZ: All right, my name is Mauricio Gutierrez. I'm from the Office of Research and I am team lead for MP 1B and C.

So we have two slides for you on MP 1 and basically, the key attributes on the slide here state our chief concern, which is that common cause failure can compromise the independence across redundant divisions, across echelons of defense, and across monitoring and monitored elements.

NRC's position on addressing common cause failure was stated in SRM-SECY-93-087, which was titled Policy, Technical, and Licensing Issues Pertaining to

Evolutionary and Advanced Light-Water Reactor Designs, specifically Section II.Q, titled Defense Against Common Mode Failures in Digital Instrumentation and Control Systems.

The staff expanded on this position in BTP 7-19 titled Guidance for Evaluation of Diversity and Defense-in-Depth in Digital Computer-Based Instrumentation and Control Systems.

CHAIRMAN BROWN: Okay, you didn't say the word independence. What you said was diversity and defense-in-depth.

MR. GUTIERREZ: Yes. There, I'm just quoting the titles that were there.

CHAIRMAN BROWN: In control of access?

MR. GUTIERREZ: Yes.

CHAIRMAN BROWN: Independence and control of access are two changes or just in my own mind, fairly critical. Your major protection against CCF is independence for those systems that have redundant characteristics for those that are single control a motor and make sure it starts.

MR. GUTIERREZ: We are considering independence. If you look at the first bullet there, it does have the word.

CHAIRMAN BROWN: Oh, okay.

MR. GUTIERREZ: CCF can compromise the independence across --

CHAIRMAN BROWN: All right, got it. I see that now, thank you.

MR. GUTIERREZ: The objective for MP 1A is to develop guidance enabling proper implementation of simple digital upgrades and replacements under 10 CFR 50.59 by the summer of 2017 this year. And David Rahn and Wendell will have a specific presentation on that working group later today.

For the MP 1B and MP 1C team, our objectives are to evaluate the industry's proposed guidance in NEI 16-16. We just received Draft 2 of that on Friday. And MP 1C is to evaluate the need to modify NRC's policies -- NRC policies, regulations and guidance concerning CCF related to digital I&C systems.

So our current activities now, team MP 1A is well underway. They are developing RIS 2017-xx to clarify the staff endorsement of NEI 01-01 pertaining to preparation of qualitative assessments as a technical basis supporting the 50.59 evaluation process.

The team working on MP 1B and C, NEI submitted a partial draft of its guidance for addressing digital CCF in NEI 16-16 Draft 1 in December

of 2016. The staff provided our initial comments in March 2017. We had a follow-up meeting on that to clarify our comments and got a preview of the contents of Appendix A in Draft 2, which was received on Friday, May 12th.

MEMBER STETKAR: Mauricio, can you help me out? This first sub-bullet here says you are preparing a RIS to clarify staff endorsement of NEI 01-01. In preparation for this meeting, I read draft Appendix D to NEI something or other.

MR. GUTIERREZ: 96-07.

MEMBER STETKAR: 96-07, which explicitly says that it supersedes NEI 01-01. So what are we doing? Why are you preparing -- why are you working on endorsing something that is obsolete?

MR. MORTON: So I can field this one.

So part of the strategic piece that Bernie is going to get into is what the short-term goals are to support industry efforts to modernize plants and then there is a long-term objective. So we have a couple of separate projects going on between the different working groups.

The first project, which is draft Appendix D to 96-07 and then NEI 16-16 represents NEI's efforts to retire 01-01, based upon previous identified

shortfalls within the industry and by the staff.

MEMBER STETKAR: Good.

MR. MORTON: To support short-term efforts to modernize plants and get more reliable digital equipment into the plants, we're developing the RIS as a clarification to the current guidance, which will be retired, once Draft Appendix D and NEI 16-16 are approved.

So that is, essentially, the long-term/short-term goals between the three documents. And I'll explain this more in my actual presentation later on today.

MEMBER STETKAR: Good. I won't ask you to remind me because I remember.

MR. MORTON: Are you sure?

MEMBER STETKAR: No, no, I take notes.

MEMBER SUNSERI: Well maybe just a preview to that. So does this short-term strategy release some of these projects that are on hold right now, they have been done and they are on hold waiting for some guidance or is it more complicated than that?

MR. MORTON: So in our interactions with industry, we have been told on a number of occasions, we have a number of projects on the shelf ready to go. It is just a matter of the regulatory uncertainty when

trying to disposition digital upgrades under 50.59 with the current guidance.

So the risk efforts is an effort to streamline the guidance, clarify some things so you can get more of these lower significant simple modifications to be more routine under 50.59 and still be safe, safely done.

So it is streamlining the guidance that is already currently there until it can be retired in the future.

MEMBER STETKAR: I'm not sure whether that was a yes or a no.

MEMBER SUNSERI: My question was this -- I mean let me restate it.

So some products were developed already under the guidance of NEI 01-01, I suppose, right? And so those are sitting on the shelf, I presume, because there is some uncertainty about the regulators' acceptance of this. So your short-term guidance that is addressing 01-01, which is being retired, will that break loose the ones that are already on the shelf ready to go?

MR. MORTON: Yes.

MEMBER SUNSERI: Thank you.

MR. HECHT: Can I ask a question on this?

Hi, okay. The question I had was so far we have been talking on the policy level but on the actual analytical level, what kind of analyses do you intend to propose or direct with respect to MP 1A? In other words, failure modes and effects analysis, assurance cases, what kind of qualitative analyses do you intend to use to enable these upgrades to be approved?

MR. MORTON: For RIS 2017-xx, we're not closing the door on any particular specific type of analysis. You can use only that analysis that is appropriate and allow under 50.59 the rule itself.

MR. HECHT: Well, that -- I mean that doesn't help break things loose. I mean you want to be able to tell people what they should do, not that anything is acceptable, right? Because otherwise, you get into this situation where they do an analysis and then it's that it's not good enough.

So do you intend to offer any specific direction on the types of qualitative analyses that would be necessary in order to get things approved?

MR. MORTON: We do and I can get into that later on in the presentation when we talk about the qualitative assessment itself, as part of RIS 2017.

MR. HECHT: Okay, I'll wait.

MR. MORTON: All right.

MR. DRAKE: Moving on to MP 2, Mr. Wendell Morton.

MR. MORTON: All right.

So as we kind of talked about this a little bit earlier. So, we arrived at Appendix D because of a number of different tracks. One is, from our interactions with NEI, NEI has worked internally with industry to see what are the particular issues that licensees are having with the current guidance in NEI 01-01. That's one piece.

The second piece is the staff itself has identified certain issues either through inspections or headquarters looking at 01-01 and seeing some of the potential concerns you have with the guidance.

So taking all of that into account and the recent other events we have had during inspections, there was an effort put forth to eventually retire NEI 01-01 and bring in Appendix D to the main generic base guidance within 50.59, which is NEI 96-07.

Through those efforts, the main goal is, obviously, to reduce licensing uncertainty by making the guidance clear and more streamlined compared to what is in 01-01 right now. And that will essentially summarize the key attributes to what we are working on

with MP 2. And part of our review efforts is ensuring that, for as much as it can be possible, some of the issues we identify with 01-01 as well as industry concerns with 01-01 are adequately addressed within Appendix D and those are the primary goals within the review effort itself.

And as is stated, the objective is ultimately to reduce licensing uncertainty and clarify the regulatory process.

And back in April of 2016, we received an initial revision of Appendix D. It's actually undergone a number of changes since we began the review process in April of last year. It's in a much different format than it was when we first submitted it. We've made a lot of good progress in the content of Appendix D so far.

The Evaluation Guidance -- Evaluation and Screening Guidance, which are the most critical pieces of Appendix D have been, the latest provisions were submitted to us in successive months and we have had a number of public meetings supporting the review for each one of those sections.

Just and I will give you some food for thought until we get into the presentation specific on Appendix D later on, there were a number of changes and

differences between the Screening and Evaluation Guidance between 01-01 and Appendix D. We will get into some of those differences and some of those additions that we felt were necessary to improve the guidance.

CHAIRMAN BROWN: Was there a comment earlier that Appendix D, a revision to that was just issued? You received it Friday or was that one of the other documents?

MR. MORTON: I believe we just received the latest revision yesterday.

MR. GUTIERREZ: No, the document you are referring to is NEI 16-16, Draft 2.

CHAIRMAN BROWN: Oh, okay. Thank you.

MR. MORTON: But we did just actually receive the latest revision of Appendix D yesterday from NEI.

CHAIRMAN BROWN: Oh, there wasn't a revision to Appendix D. You received that yesterday, you said?

MR. MORTON: Yes, we just did.

MEMBER STETKAR: The one we got for this meeting is dated March 29, 2017.

CHAIRMAN BROWN: Yes, and I totally missed that.

MEMBER STETKAR: It is apparently ancient by now.

CHAIRMAN BROWN: Yes, obviously.

This is your second slide, so I don't have to be reminded but I guess there's another one in here.

When I went through the RIS and I went through the NEI 01-01, which was kind of a just gee you have got to evaluate everything you may ever have to do in order to get anybody to agree with what you want to do. I mean it covered the whole soup to nuts qualitative, quantitative discussions and all kinds of stuff.

And I guess relative to replacing the digital I&C systems, I guess I was hoping -- not hoping. That's the wrong word. I'm somewhat heretical on this. I happen to agree -- this is a personal opinion now. Do not take this as a subcommittee agreement -- in that there is a lot of systems associated with the plant which don't have any direct effect on the fundamental safety of the plant.

I will give one example just from new plant designs. There are two of them relative to TG set voltage regulators and governors. Their feedback control systems, they either work or they don't work. That's a business-type issue with the licensee. And

yet, a tremendous amount of time is spent evaluating those as part of the overall licensing approach.

And this, again, a personal thought, is that if the licensee wants to change out his voltage regulator for a better voltage regulator, it's his problem to make sure it's reliable from a business standpoint, not from a safety standpoint.

And there is some gray areas, probably, we could argue about, relative to heating and ventilation, and air conditioning of the main control room, the chillers associated with that and other stuff. But there is a lot of stuff where if you took a top-down approach, as opposed to a middle-up from the bottom, which is the way I see a lot of the discussion in some of these documents is, you could free up a lot of areas where industry could just go ahead and change out the stuff and you all wouldn't even be involved, other than the records are there if you ever want to -- but it's not your job to make sure that the plant runs all the time. It's the licensee's job. Your job is to make sure it's safe.

So that's my kind of heretical statement is that if I had been in charge of this, I would have tried to do two tracks. You know put aside the reactor protection and the engineered safeguards. Put those

in a little bubble for right now. But you look at all the other supporting systems, which ones don't provide mitigation for accident-type stuff or support for those and which ones are strictly there, which somehow people are reluctant to go work on. And I suspect if each plant, each licensee could identify those systems which they think they should have free -- I don't like the use of free rein but I will use that term anyway, free rein to change at will and get agreement with that up front and just say fine, go ahead and do that with each licensee.

Anyway, that's the heretical thought. I'm not asking anybody's agreement. I'm just saying if you want to make progress on this instead of -- I'm really kind of addressing Jose's comment a little bit, you go through what is it; how do they get through the wickets and the quantitative, qualitative, whatever it is; as well as Myron's comment are you going to provide guidance on how these analyses are going to be done that are acceptable to you, which is very difficult to do?

So anyway, I throw that out on the table as a thought process and we'll let others chew on that as they may want to.

MEMBER MARCH-LEUBA: I'd like, for once, to concur with Charlie.

CHAIRMAN BROWN: Holy!

MEMBER MARCH-LEUBA: In the clean example, if I am buying a new pickup truck with digital controls, why does NRC care? What does the public care?

But I can make an argument that the turbine controller, it may not be a safety-related change because I do analyze all the turbine trips and I must provide it. So maybe by putting the turbine controller, which may or may not have CCF on it, I am maybe changing the frequency of those turbine trips a little bit but I survive them anyway.

So, what we have to balance what is needed. On the protection system, if it fails, you can't afford it. That is definitely a place where we need to go but a pickup truck, forget it.

CHAIRMAN BROWN: Another example -- we might as well milk this all we can right now, while it's current.

One of the risks, I can't remember which one, talked about even in the reactor protection systems, I think it was in the new RIS, I don't remember right now, that certain things like circuit breakers or the relays that actuate the circuit breakers and the downstream actuation not in the voting processing part

but the final actuation, that is a relay. It's a hardware piece of stuff and there should be allowability on certain -- obviously, if you replace a switch because the switch broke and you can't get the exact identical switch that you had before, I don't why NRC -- I don't know why an LAR would be required for that.

A circuit breaker may be something else, if they are going to replace it with a new circuit breaker that has an embedded processor in it, where now you need a set of software that has to be generated, which may necessitate software modifications, even though you have an on/off type trip signal going to it. There is some point and I don't know where that point is. That's why I segregate separate the reactor protection systems and safeguard systems from the rest because you have to have the plant shut down and you have to be able to put water in the plant for safety reasons.

So, there is a little bit of caution in there. I mean there are even now smart relays that people are selling as replacements for their old electromechanical relays which, again, have embedded devices in them, which may affect the evaluation of the risk. I'll throw that in. That's a heretical term.

Maybe you can't look at it deterministically. But anyway, that's --

So anyway, that's why I separate those out but I just think there is a whole plethora of things in the rest of the plant that you all could just release on a licensee by licensee or a plant design by design basis and it ought to go right into these areas. And from a tactical standpoint, you ought to be able to do that now. It's not rocket science. That's my personal opinion.

Anyway, Wendell --

MEMBER STETKAR: Okay, here's another opinion.

CHAIRMAN BROWN: He's going to counter me now.

MEMBER STETKAR: That's right. Because a 50.59 evaluation requires you to confirm that there is no -- I'll quote from the regulation -- it does not result in more than a minimal increase -- minimal increase than the frequency of occurrence of an accident previously evaluated. I don't know what a minimal increase is but that is frequency. And it does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of systems evaluated.

Now, I don't know what a minimal increase is. It also says that it should not introduce any other consequences.

So all of your things about all of this stuff that isn't important, if I trip the plant every other week because I got crappy controls on my call it voltage regulator, call it my chiller that doesn't make any difference, call it my controller for some pump out in the plant, I have now created more than a minimal increase in the frequency of accidents that are evaluated in my licensing basis.

So just keep that in mind, also. And that's regulation. That's not risk assessment. I don't know how to evaluate that. I do in risk assessment but I don't in deterministic space and that is, essentially, I think what everyone is struggling with here. So, again, this is individual --

CHAIRMAN BROWN: Yes, I went through that as well and that was one of my questions that I had not raised that I noted what do we mean by minimal. How do we determine that?

MEMBER STETKAR: I just want to make sure that --

CHAIRMAN BROWN: Yes, that it's not lost. I just think you can go too far in terms of assessing.

I mean if you start tripping the plant every week, the licensee has a problem and the NRC is going to have a problem if it trips every week, forget whatever the reasons were they did it.

MEMBER MARCH-LEUBA: Well, that's on this theoretical plant.

CHAIRMAN BROWN: So, we're getting too far down. Let's go ahead, Jose.

MEMBER MARCH-LEUBA: I would like to offer a dissenting opinion. The expectation from anybody that changes a controller from an old to an old one that is collecting dust over there and is difficult to replace by a digital. Digital works much better.

MEMBER STETKAR: That's the expectation. The experience is that sometimes they don't.

MEMBER MARCH-LEUBA: And well, you pay for it. Is that there are some common cause failures that might catch you. You just don't know where they are. If you knew them, they would have been fixed.

MEMBER STETKAR: I'm not talking about common cause failures. I'm talking about -- notice I didn't use the word common cause.

CHAIRMAN BROWN: It's not common cause. It's just a reliability issue.

MEMBER STETKAR: Sometimes new stuff is

just new stuff.

MEMBER MARCH-LEUBA: So let me finish. This was needed to do EMI, which is a real problem with these systems. But if a licensee installs this system and it starts tripping the plant once a week, they are going to fix it. It's not going to increase your core damage frequency. It is going to increase the unreliability.

The fact that it has the probability of maybe one failure, they will let it go. When they have two failures, they will fix it. So, it is not going to increase the probability of core damage, in reality.

CHAIRMAN BROWN: You can see we have unanimous opinions, thought processes on this issue.

John, did you want to say something?

MR. LUBINSKI: Yes, thank you. You had said at the end of your comments earlier that you were not looking for people to agree or disagree but I will say in principle the staff agrees with you. The wording is where it gets a little bit different.

The 50.59 is not set up where we can say these systems can be upgraded without a review; these need a review. It is really along the line of looking at what is in the criteria. So we have to follow 50.59 with respect to the issue.

And if I can back up in maybe addressing some of the questions I heard already or comments that are going to come up later that we need to remind you about, but why are we doing this? That's the intent of the RIS is to do exactly what you were saying is, let's look at these systems right now that we can scope in from the standpoint of saying what is the overall risk to the plant associated with these systems and what kind of information can we give licensees with the scope of those systems to say how can you do an adequate qualitative assessment that meets 50.59? So, it's only those systems that you are going to be able to do under 50.59 and that's what the RIS will discuss. And how do we get that out immediately so that we don't have to talk about those things that we believe don't have a major significant safety impact?

Where are we going with the rest of the plan and why are we doing this to document NEI 01-01 that will be withdrawn at some point? And it's because we need to actually review and approve two documents before they can withdraw 01-01. One of them is Appendix D to the 96-07 and the other is 16-16, which has just been submitted last Friday with adequate information for us to do a review.

16-16 is going to apply beyond 50.59.

That's guidance for doing common cause failure for not only 50.59 reviews but also license amendment requests and including RPFs. It will be applicable to those systems as well.

So what we need to do is as we are going through and looking at the bigger picture from the standpoint of all the upgrades that are going to be done and how these two documents impact those upgrades, we want to get something out more quickly to free up that population of items.

So, are we considering risk in looking at what that population of items is? Yes. Are we using that to determine the level and pedigree and rigor on the qualitative assessment that is done? Yes, we are considering that and providing this guidance under the RIS.

And I do have to comment here is that one of our goals was to have the RIS out for public comment prior to this meeting today. Unfortunately, we had an aggressive schedule no the RIS for staff. Definitely the NRC staff, and the industry, and I am sure ACRS members are aware, it normally takes a while to get a RIS out the door. We initiated this around the end of March or middle of March to issue a RIS. So within two months, getting a draft RIS out the door is pretty

impressive. So that was the reason. But we do expect to issue that shortly and we were hoping to have had that beforehand. It may have addressed some of the questions that we could talk in more detail.

However, Dave Rahn, when he talks later today, and Wendell, as part of his discussion, will have some of the details that specifically say the two intents: what's the scope of what's covered under the RIS and what is the detail and information needed to do that qualitative assessment with respect to those scope of systems?

MR. MORTON: And if I could add just one more thing to that before we move on.

So, to your point, Charlie, we have had multiple public meetings with industry, specifically with NEI on the RIS development. And one of the exercises we went through was we asked hey, what are the type of systems that you either have on the shelf or that you are looking to upgrade to digital controls. And actually they provided us a list of those systems that they are actually looking for, the things that are of concern and are problematic. And with that list, we use that to inform the development of the scope and of the criterion for RIS 2017 so that it still aligns with 50.59 requirements but frees up a lot of those

systems to be done under 50.59.

So that is sort of the nuts and bolts of what we have done. And we can explain that more in detail later in the presentation but that is just sort of a flavor for how we have been working with industry to develop those systems that we are looking for to be done and release those under 50.59.

CHAIRMAN BROWN: Okay, one comment relative to John, your comment about I know 2017 covers some discussion on reactor protection and safeguard systems. And I guess I was -- that's a little bit -- I've got some boundaries that I work with and in particular, based on our experience on the new design plants as they came up and how the digital systems were presented or designed and the initial resistance when software-based voting systems were used and the resistance to even having the watchdog timers to ensure that you didn't have a common software glitch corrupt data that compromised all four divisions and locked it up.

So, when I start seeing you bringing the reactor protection systems in on the RIS side and the safeguards, we get a little bit nervous when you start saying well, gee, they can replace the entire reactor protection and safeguard systems under 50.59 without

-- and you don't find out about the details for, what is it, two years or something before a report comes out based on the 50.59 requirements, that is, to me, a little bit problematic.

So, I didn't see any separation of concerns, once you get into some of the issues, in terms of voting and ensuring you get a shutdown. It was kind of hard to do. How you find the words to do that, I don't know. I'm just saying that's where I get a little bit nervous, based on our past experience, at least mine over the last nine years.

MR. LUBINSKI: I appreciate that and, again, I will agree with you. We get nervous there as well. And I'll make the statement that the intent right now, the RIS, and you will hear this in the scope, is a wholesale replacement of the RPS is not something we would expect to be within the scope of this RIS. There may be certain aspects to it that will be within the scope of the RIS but not the entire.

Also, with respect to procedure -- and they will talk about that more later and we will engage more specifically on each of those items.

I also want to highlight that, again, what our intent was we, and when I'm saying we, a lot of credit to Wendell and Dave Rahn who have put together

the scope of this RIS, is in the draft what we're trying to do is look at what do we believe is potentially the largest scope we can put into the RIS so that we can put that out for public comment. And I think sometimes we have our internal mentality here in the NRC that we are such perfectionists that we hope we issue a RIS that when we comments back everyone just says this is perfect, thank you, issue it as final. We're looking at the philosophy we believe right now that if we get no comments, we believe it would be acceptable and need appropriate safety requirements but we also are open to hearing comments from all stakeholders. We have engaged with industry at a certain level at this point but we are having a workshop next week open to the public on the RIS. And that's going to be specifically the question is how big should this scope be.

If we get to the point where we think the scope right now is too big and there are certain systems in there that have too many questions, we believe we will just take those out of the scope because, again, it doesn't negate in any way the benefit of the RIS because, again, we would still have a fair amount of systems that will be covered. And does that mean those systems maybe cannot be done using this qualitative assessment? No, it just means under this RIS, we are

not providing that guidance. Instead, it will fall into either 16-16 or Appendix D.

So, we welcome comments from -- and I know there is members of the public on the phone line and people from the industry in the room. We welcome those kind of comments during the comment period of how big should the scope of those systems be.

CHAIRMAN BROWN: Okay, thank you, John.

MR. MORTON: I think that's pretty much it for MP 2.

MR. DRAKE: Okay, moving on to modernization plan 3.

CHAIRMAN BROWN: One observation. When you're operating your slides, your microphone, if you hit that thing, it's going to -- our transcriber/recorder is probably going to leap out of his chair and get -- I want to keep him calm, and keen, and attentive.

PARTICIPANT: It will keep him awake, though.

CHAIRMAN BROWN: Yes, well, that does more than keep him awake, I will guarantee you. Okay, so just be careful. Thank you.

MR. TANEJA: Okay, thank you. I'm Dinesh Taneja, technical review in the NRC Branch in the of

Office of New Reactors.

So the MP 3, I'm leading this modernization plan. The title of that is Acceptance of Digital Equipment. And our team in the NRC not only includes the I&C folks but we also have people from the vendor and QA branch participating in this task.

So the issue that we are facing here is that most of the I&C digital -- you know I&C equipment and component that are out there are all becoming digital. And it's more and more so. And they are not really built or designed to the QA requirements of Appendix B.

So in order for them to be used in safety applications as either replacement parts, components, or new systems, they have to go through a 10 CFR Part 21 commercial grade dedication process, which really is pretty onerous process and very time consuming.

So what the industry and the NRC is looking for is to find an efficient and effective way to achieve acceptance of these digital equipment for safety-related applications.

CHAIRMAN BROWN: So MP 3 is literally focused only on the safety applications of the QA process of the equipment?

MR. TANEJA: MP 3 is focused on using the

commercial grade available equipment in safety applications.

CHAIRMAN BROWN: Okay.

MR. TANEJA: Okay. So the existing process that we have is really what we have is based on a standard that we endorsed back in 1997. It is an EPRI TR-106439. That is the guidance that provides how to dedicate digital equipment and which references EPRI NP-5652 that is a generic dedication, I guess. It is a guidance document that provides guidance how you dedicate a commercial grade item.

So the activities that have been performed under this task, we have issued a RIS 2016-05. That was issued earlier last year, which basically informed the industry of all the embedded digital devices and you know how to treat them and how to look out for them.

And we have a draft reg guide that is out there and in the process of being issued is DG-1292, which is endorsing the Rev. 1 to EPRI NP-565 to the commercial grade dedication -- Dedication of Commercial Grade Items I think is the title of that document.

Where we are right now is that under this activity, EPRI has undertaken a research activity. So they are evaluating a process which is called safety

integrity level certification. And that SIL certification is done to IEC Standard 61508. The title of that is Functional Safety of -- that process is used in petrochemical and fossil industry right now. They use that process to use the equipment that is used in the critical application is sort of applied to different levels of SIL. And SIL 1, 2, 3 and I think our reactor protection system, you know we call them SIL 4 type devices, whereas the petrochemical industry and the other industries they usually categorize up to 1, 2, and 3. And that is based on the risk and on the safety significance of that.

CHAIRMAN BROWN: Type 4 is -- the difference is that it's more critical? It's a higher level.

MR. TANEJA: It's basically there is more risk associated with that equipment not performing its function.

CHAIRMAN BROWN: I agree with that.

MR. TANEJA: So but you know it is a process that is somewhat established process and it is a process that is not only used in the U.S. but it is used globally.

And recently, I had some interactions with our DOE counterparts and they are using this process

in lower safety significance application as well.

So what the EPRI people are doing is right now looking at the rigor that goes into doing this certification activity and then seeing if we can leverage some of that work that is already done. And I think the intent is if a licensee wants to use a SIL-certified digital component, whether it is a single controller or a small PLC that has been certified and has a SIL certification, you know they may not have to do as much work under Part 21 for dedication and maybe streamline activity, and where we can accept that and use it in safety applications without do as much work as is being needed under the current framework.

CHAIRMAN BROWN: What does SIL mean again?

MR. TANEJA: Safety integrity level.

CHAIRMAN BROWN: Okay, safety integrity level.

MR. TANEJA: Right.

MR. HECHT: Can I ask a question? With respect to the components, the safety significance depends on how they are applied.

MR. TANEJA: Correct.

MR. HECHT: So how does one deal with a certification of a component, when it's being used in the higher safety significant application or higher

criticality application than what the IEC might have approved or is there such a construct?

MR. TANEJA: Right. So the IEC 61508, which I guess has a ISA-84 standard that is based on --

CHAIRMAN BROWN: Corresponds to that.

MR. TANEJA: -- corresponds to that one. So that has a risk element attached to it.

The way you determine which one of the SIL 1, 2, or 3 application is determined by the risk significance of that. So, the application of that is dependent on the risk significance.

So I think the effort that we are trying to make right now is we are trying to take the -- so, in our current process, we say identify critical characteristics and then verify them on a commercial product, in order for us to use them in safety.

So identification of critical characteristics for a given application are tied to that. And how do you verify them? The regulation allows you to use four different methods for verifying them.

So what this effort that this research activity is trying to do is only utilize one of the critical characteristics, which is I believe it's

focused on dependability characteristics of digital items and see if you can leverage the work that is done in the IEC certification process and then utilize that, and then carry on with the rest of the dedication activity under Part 21.

So it's not just basically saying okay, I got this SIL-certified product, I can just simply go and put in the plant. We have to take that and then we have to look at the application and do the remaining activity under Part 21 regulation to accept that item.

So it is kind of -- right now, it is a baby step, I would say. If you want to see this good work that already gets done, it is a lot of rigor that goes into this SIL certification. And can we accept some of that work that is already being done?

MR. HECHT: Okay. I'm sorry, you moved into something called Part 21 and I don't know what that means.

MR. TANEJA: Okay.

MR. HECHT: But the more general question is is that there is a certain risk level associated with a SIL classification and nuclear plants aren't classified using the IEC criteria.

MR. TANEJA: Correct.

MR. HECHT: So you basically say that Part

21 is a way of bridging that gap or what does that mean?

MR. TANEJA: Regulation under 10 CFR Part 21 allows you to use a commercial grade item in a safety application, provided you go through a dedication process.

MR. HECHT: Okay.

MR. TANEJA: That dedication process is a rigorous process which says if I take this cup that did not have any pedigree on it and I want to use it as a quality product, I have to go through a certain activity to say that this thing is equal or better than a product that was built under a quality assurance program, okay?

So, that is a regulation that allows a licensee to use a commercial product, provided they go through this rigorous dedication process.

So, if we do that on all digital components, the difficult part of dedicating additional component versus let's say a bolt, a bolt's critical properties are a handful. You know you are looking for sheer strength, and you are looking for tensile strength, and all that. You can test that and probably take a batch and validate that. Whereas, when you identify the critical characteristics of digital, they are enormous.

So this EPR TR Standard 106439 that we

endorsed gives us plenty of that guidance in there on how do you do that for digital equipment. Now, if we did that, and I think that is where the industry's focus is, is that if we did that for everything we went out to buy, that's a lot of work. If we just go and buy something that has already been certified, has a SIL certification on it, we know that they went through a lot of this rigor in testing and identifying all of the critical features of that thing. Can we leverage some of that work?

And I think that is where the EPRI research is now looking into and the idea is can we leverage some of that work that has already been done, if I want to use a SIL-certified component and then still go through under our regulation of Part 21 to accept that item.

So it is kind of just a piece of it. So we are not just saying you know hey, if it is certified, just use it. No.

So that is where we are. We have had a couple of meetings. So the EPRI research has just gotten started. We expect to get their result early next year on this one.

And based on how these results come out, then the next step would be is that we are working with our QA folks. And apparently we have done something

similar with NEI on -- it's something to do with the labs that are not, doesn't have a QA classification that do a lot of that work. So, we have done some work where we have accepted the use of those labs by the licensees. There are similar processes there. So we kind of are trying to see if we can leverage that process in seeing how we can accept this SIL-certified component.

So we are working on that and will see where that goes.

MEMBER SUNSERI: I had a question. This question, probably I will ask it of the industry representatives when they're up. I think they are probably more appropriate to address it but I will ask it here, also.

As far as the EPRI research on the SIL certification, I understand how having certified products bringing into the Part 21 process would facilitate that. You have a benchmark, essentially, on the quality of a product coming in.

My question is, if I understood you right, there is being created a new level of certification 4 for the nuclear safety-related applications versus using 3, which is the highest level for petrochemical and others. Did I hear that right?

MR. TANEJA: No, I'm not saying that. I'm

just saying that we are, right now, looking at is because most of the product that are on the shelf right now available, what you are going to find is SIL 3 certified. Okay?

So you basically are saying that I know that I can go and buy a SIL 3-certified component. So let's use the pedigree of SIL 3-certified component and see if I can extract some of that information and use it in a nuclear application.

MEMBER SUNSERI: Okay, so I agree with that. I thought I heard you say we were creating or we were looking at a different level of certification.

Okay, thank you.

CHAIRMAN BROWN: When you say extract, I mean, I'm just trying to get my hands around, are you trying to just say if it is qualified to SIL 3 it is okay and you just go ahead and use it or do you have to do something else with it after that?

MR. TANEJA: You have to do something else with it after that.

CHAIRMAN BROWN: But you don't know exactly what that is yet?

MR. TANEJA: Well, you know part of the Part 21 process requires you to identify all of the critical characteristics. And I think one of the

characteristics falls into the category of called Dependability Critical Characteristic. Okay?

So, the intent right now is to see if we can get that part of the critical characteristics taken care of by using a SIL-certified component but you still have to address the other critical characteristics, whether they may be environmental, they may be seismic, they may be others, right.

CHAIRMAN BROWN: Okay, I think I understand what you're saying. So Part 21 describes if you want to use this other part there is a series of things that you have to go through to certify it or to say it's okay.

MR. TANEJA: Right.

CHAIRMAN BROWN: And all you're saying is that of the ten items on the shopping list, if we can take the SIL and say it covers three of them, that means fine, we can close that out and the other seven are the only ones that have to be paid attention to.

MR. TANEJA: Correct.

CHAIRMAN BROWN: Is that correct?

MR. TANEJA: Yes.

CHAIRMAN BROWN: Okay. Now, I understand it a little bit better. Thank you.

MR. TANEJA: Okay. So that's where we are

on this activity.

MR. DRAKE: Okay, moving over to modernization plan 4, Mr. Bernard Dittman.

MR. DITTMAN: Okay, so my presentation is going to be in two segments; first, focusing on the tactical area, which we have touched upon earlier, and the second segment will be touching upon the strategic.

MP 4 didn't start at the same time as the other modernization plans to allow progress from those plans because MP 4 in the tactical area builds upon the outputs from the other modernization activities.

So, the work it's going to do, as Wendell touched upon, is to exercise modifications and associated guidance for those changes under 50.59 without prior NRC approval test runs before. That might be folded into clarifications to the existing regulatory infrastructure, for example, BTP 7-19. And the other aspect is improvements to the digital I&C licensing process when a licensee determines it has to come in with a license amendment request.

So we're going to build on the MP 1 through 3 activities. We are going to refine that guidance and make changes to the regulatory infrastructure in the shorter term and we are also going to develop corresponding inspection guidance that matches the

regulatory guidance.

So in this way, we're going to be addressing both types of digital modifications, both those under 50.59 without prior NRC approval and those with prior NRC approval.

CHAIRMAN BROWN: Before you go on, go backwards. No, no, you're still there. I'm sorry. You're still on 18. I apologize.

When you say refine guidance under the objectives, the second bullet, is that aimed at trying to say hey, when you submit an LAR, these are the things you have to cover? I mean are you going to be specific or is it -- I mean that is the way I would read that. If somebody says we're going to now give them a shopping list of things, that this is -- if you are going to submit the LAR, you want to get this through, do A through Z and then we'll be happy.

MR. DITTMAN: So there is a lot of discussion on exactly what it will be. Currently, you have ISG-6 guidance that was developed as part of the activities that started ten years ago. And the question was well, how are we not going to repeat mistakes, or the lack of benefit that we got, or we didn't seem to achieve the goals of the prior guidance. So, really, we're focusing on testing the guidance

before we fold it into permanent guidance as one means.

I think from discussions with industry, the emphasis isn't the clarity of the guidance. That's part of it but it's some of the timing of what is required. Why is it really required? Is it needed for the safety conclusion? Are there other methods that could be used to reach a reasonable assurance determination? Those kind of broader questions, we're not sure if they'll be done in the shorter term versus the longer term.

Since all license amendment requests are somewhat plant-specific and unique, it is a little bit challenging to say there is a one-size-fits-all approach. However, industry has proposed some things, some approaches in recent meetings like organizing the license amendment information to demonstrate and focus on safety principles versus I would say clause-by-clause compliance as a way to facilitating the staff reaching the safety conclusion.

So, we haven't worked out all the details about what information will be there. Will be it the kind of explicit list you might be looking for, Charlie, but they need to be worked out. Those are things to be worked out.

CHAIRMAN BROWN: It's still loose is what

you're saying or it's vague. I mean you don't have a --

MR. DITTMAN: We don't have a --

CHAIRMAN BROWN: It's not defined.

MR. DITTMAN: The devil is going to be in some of the details.

CHAIRMAN BROWN: Okay. All right.

MR. DITTMAN: We understand some high-level ideas but the mechanism is to getting all the ducks in a row to allow the staff to reach a safety conclusion in a time frame that is agreeable. That hasn't been ironed out.

CHAIRMAN BROWN: Okay.

MR. LUBINSKI: If I could add to that. Thanks, I agree with everything that Bernie said and a lot of the details are to be worked out.

And Charlie, you had said about the type of information to be submitted. Yes, that is one thing that definitely is what information needs to be submitted and in how much detail.

The other that will be addressed as part of this is when do we issue the license. The one issue that's definitely on the table now for discussion and we need to evaluate it is, do we issue the license amendment prior to the factory acceptance testing being

complete.

From a licensing standpoint, you can make an argument that you have information that provides reasonable assurance at that point if it's designed and works the way it's designed to, it's safe. Now, what that does is that would shift the risk back to the industry because if after the factory acceptance testing modifications or changes are needed, or something different than is in the license application that they had, they may have to come back for a second license amendment. But that would be something that we would be engaged in the industry to determine what the value is.

Another we're looking at is I believe if you look at ISG-06 and, again, this is more my opinion now -- I'm not going to say this is the entire group -- is it follows a lot with the light cycle development methodology of many of these systems; which is a little different than we do in some other applications where we require, during our acceptance review, a licensee to come in with a final design system on Day 1 with adequate detail for us to make the call.

Well, we've allowed people to, along the way, provide more information as it has been developed. So, we are looking at that as well. When do we start

the license amendment application process and when do we end it? The perception is that the process takes too long because it takes a number of years to go through. Well, some of what we're carrying, if you will, is pre-license application work and maybe post-application work preventing another amendment from coming in the future.

But that has a lot of work to do with the industry on the benefits of doing that.

MEMBER BLEY: Maybe this isn't the right place to ask this question. Since you pointed back to my question earlier, how important does the staff, and I will be interested in the industry's thoughts on this, too, how important do you see this May tabletop exercise as a confirmation that what you're planning here is likely to need substantial improvements?

MR. DITTMAN: So I'm not sure if that's really a question for myself or it should probably go to Wendell.

MR. MORTON: Yes, that would be a question for MP 1A. So the tabletop exercise is --

MEMBER BLEY: That's great.

MR. MORTON: The tabletop exercise is really to --

MEMBER BLEY: He has you stove piped

pretty well. But go ahead.

MR. MORTON: Yes, we try to be. We try to be, keep everybody sane.

So the exercise is targeted to put the draft RIS through its paces to see in a realistic, real-life example of various mods that are proposed what are some of the holes, or shortfalls, or weaknesses, or gray areas that need to be addressed so that we can achieve the short-term goal to have more of those modifications be more streamlined and clarify it under the RIS 2017 structure under 50.59.

So that's part of the short-term strategic -- is that strategic or tactical -- tactical for the short-term. So it goes toward that but it's subsumed within the MP 1A group but it goes part out.

MEMBER BLEY: That's okay. So you see it as an exercise of the RIS. Is it also an exercise of the NEI guidance? I assume it must be.

MR. MORTON: It's not specifically targeted toward NEI guidance. I believe you are referring to Draft 96-07 Appendix D or NEI 16-16. This is specific for the RIS itself.

MEMBER BLEY: Okay.

MR. MORTON: So just I will add to that that those documents will be put through their own paces

at different time frames.

MEMBER BLEY: Is that on the schedule somewhere for now?

MR. MORTON: That's not specifically on the schedule, at least for MP 1A. We will add a group discussion for it.

MEMBER BLEY: Is that on NRC's schedule somewhere? It's already scheduled. So you know about when that's supposed to happen.

MR. LUBINSKI: The short answers to that are yes. As we go through the process with Appendix D, we already start to schedule, in each of the public meetings where we start to go through examples. And we have done that as part of the meetings, where we run examples through how would you put this modification through Appendix D. How would you ask the questions? We have done that in past meetings and we are doing that in future meetings.

With respect to 16-16, since we just received the document, we're not able to say where it is in the schedule at this point. But we have made it very clear that as we continue to work through it, we want to pull those examples in tabletops.

In 16-16 space, we did have a tabletop back in February 8th and 9th, where we looked at Appendix

D and 16-16 to try to draw the corollary between the two. It told us a lot about both of those documents and where the linkage needs to be between them, as well as ties.

But to say in the schedule do we have right now the dates of each of those tabletops, no. But in each of the meetings, we ask the appropriate question of the appropriate time for those tabletops.

MEMBER STETKAR: I sure hope when the industry comes up they can provide some clarity on this and where they would like to see the Agency providing the priorities because if, indeed, this is short-term focus on only very, very explicit things, then I kind of get it. But if there is a bigger concern among the industry, then it sounds like -- you know I won't be here in nine years from now but there might be other folks sitting here nine years from now saying remember nine years ago. As Dennis brought up earlier, we had a lot of these discussions that sounded really optimistic and nothing's been done.

MEMBER BLEY: I wasn't -- well, I was looking for an exact date, if you had it. But are we talking late this year, next year, five years from now? I just don't have a clue where you see this ending.

MR. LUBINSKI: Under 50.59, we're looking

at this year. We have got our scheduled meetings and it will be as a part of those meetings.

MEMBER BLEY: So this ought to all wrap up.

MR. LUBINSKI: Yes, sir.

MR. MORTON: Under the Integrated Action Plan, we have a major milestone date of third quarter this year for the tabletop session for Appendix D. But Appendix D is still in the process of being finalized in terms of the review. So, it's not quite ready yet.

MEMBER BLEY: Yes, I got that.

MR. LUBINSKI: But 16-16, again, it's a longer term and that needs to be complete before someone could fully implement Appendix D with respect to systems that are uncovered by the RIS.

MR. HECHT: Can I ask a brief question? There was a tabletop exercise indicated in Chart 9 in May 2017. Was that the Appendix D tabletop exercise that you are now talking about or is that a different one?

MR. MORTON: So that would be the RIS tabletop exercise for May 25th.

MR. HECHT: I see, okay.

MR. MORTON: Yes.

MR. DITTMAN: So the staff has been meeting with industry and the main focus is the creation

of detailed plans to produce this new digital I&C licensing guidance.

We are also trying to prioritize the complete set of activities because the new guidance the industry is seeking seems to be something more in the nearer term that is taking the focus. So but there is a broader set of activities that need to be done in terms of the big picture modernization assessment of the entire I&C regulatory infrastructure.

So, the other things we're doing is we're trying to identify the licensing actions that would be applied to using the MP 1 through 3 outputs and this new 4A guidance on a license amendment request process.

So, we met with industry in two public meetings, February 28th and April 13th. That's when industry requested the focus on the digital license amendment guidance be a higher priority in the near-term.

And in April, industry proposed a notional approach on how to develop that guidance with staff input. So that was they had proposed a process similar to how NEI 16-16 is being developed where they would submit sections for staff review.

The industry expressed a desire to complete this new licensing amendment request process

by December of 2017 to support some kind of large digital modification of a protection system in the late 2018 time frame. So there is a lead time for them to prepare that information.

So, we're still planning the details of the scope of what we can include in the time frame and developing a schedule in the associated resources to produce some level of guidance, improved guidance.

We could have additional meetings to finalize the scope, including an upcoming meeting on June 8th.

So in essence, industry is maintaining that some of the aspects of the digital I&C process requires too much information. Staff has done similar lessons learned, activities through the Diablo Canyon pilot and identified areas for improvement. We're working together with industry to reconcile where we have broad agreement and what we can do in the time frame needed and to the degree that would actually facilitate the licensing action that industry is interested in.

So, industry has expressed that maybe that some of the information, the burden to produce and docket it creates a burden, the net burden is an impediment, basically, from a cost standpoint. And they want to make sure that when they docket something,

they understand the nexus to safety of the submittal.

I think the way that industry is proposing this notional license amendment guidance, they will create a mapping of what is required by ISG-06, how it would fit into their new structure, what wouldn't be covered, and what might be moved into some other regulatory regime. Or something like John alluded, if factory acceptance testing is not required, you know what is the -- where that might fall under inspection or what activity like that so that the staff could reach a safety conclusion and issue a license amendment.

So, industry is looking for and staff is also looking for a scalable and tailorable licensing process. And this gets back to Member Bley's comment, maybe the issue with ISG-06 and industry size is that they didn't find it is actually impractical, given their ability to create a business case for protection and modifications, upgrades that they were interested in.

So they want the review of a large amount of the products like a lifecycle process to which our current guidance is aligned to be moved like factory acceptance testing and to the maximum extent practical fall under the standard QA processes of their Appendix B program and become an inspection activity. That's

a proposal on the table that the staff is still evaluating what needs to be done in that area and whether that can really be done as a short-term activity or if it is affecting a broader scope of our regulatory infrastructure.

CHAIRMAN BROWN: So that means approving the license -- I'm just trying to take -- you said go to inspection. So you issue the license. The design is approved. And then it is issued and now you still, the vendor may still be going through its factory acceptance test but that becomes an inspection issue, not a licensing issue.

MR. DITTMAN: Right.

CHAIRMAN BROWN: Is that what you're aiming for?

MR. DITTMAN: Industry is aiming for that. The staff sees a way to, at least from the factory acceptance test standpoint, maybe getting there.

I think industry's proposals go deeper. They want to provide sufficient information at the system design level to allow detailed hardware and software lifecycle design implementation test, that to also fall under inspection and that's where some further clarity of what is actually being proposed and what will be where we need to work out in the time frame,

if it's doable.

CHAIRMAN BROWN: Okay, go on.

MR. DITTMAN: So industry has one of their issues about regulatory certainty deals with inconsistent assessments among headquarters or the regions doing inspections. And certainly is preventing them more broadly adopting digital I&C. So, they're looking to develop the inspection guidance in a way that eliminates this concern that provides regulatory certainty.

Inspectors might, right now, might be using licensing guidance rather than inspection guidance, lacking inspection guidance, and they may interpret it differently than the staff did during the licensing. So that is a targeted area to be addressed.

And industry is also interested in standardizing their digital I&C engineering guidance within industry and if the regulatory practices --

CHAIRMAN BROWN: Excuse me. I forgot to put it on mute.

MR. DITTMAN: That's okay.

CHAIRMAN BROWN: I thought I had done that. I apologize.

MR. DITTMAN: So if the engineering design practices can fall under the standard quality assurance

program and they satisfy the staff's I guess informational requirements equivalent to the current guidance or better, then industry sees that as a way of making the staff's review during licensing aligned with what would be expected for inspections.

Of course industry, if I mischaracterized some of their approaches, I encourage them to state it more clearly than I did.

So we're still working on prioritizing the detailed plans with the stakeholders regarding focus of MP 4A tactical and 4B. So, we're going to update the IAP to reflect changes and we expect to happen throughout this.

The MP 4B, the strategic effort is going to go on for some time. So, we're just going to keep updating the IAP to reflect the current approaches and plans.

We're also going to be continuing to engage industry and stakeholders to identify any other areas that might be right for some kind of tactical improvement if it goes beyond what the current scopes are. So we're just going to keep our ears open for that.

And also, we would fold those into the IAP, as appropriate. And one aspect of that is

incorporating the lessons learned in our prior use of ISG-06 with Diablo Canyon, in order to develop this new or revised digital I&C license amendment guidance.

So in this process, we're still counting on industry to identify actual planned digital upgrades upon which we could test proposed guidance before we commit to folding it in to the more permanent regulatory infrastructure. And that gets back to one of Member Bley's comments. We don't want to repeat mistakes of creating something that we can't actually execute to.

So again, we're going to work with industry to refine our modernization scope and extract lessons learned as we proceed with 4A, in order to inform 4B activities.

So 4B is really in a listen mode to extract information and evaluate it to see whether these nearer-term improvements, the degree that they align with broader assessment and modernization initiatives.

So that leads to 4B, broader assessment of the entire digital I&C regulatory infrastructure. And really the objective, it's a lofty one. It's high level but it's important and it's going to take some time to enable the large-scale safe adoption of digital I&C through a broader modernization of the infrastructure to make it more performance-based,

technology neutral, simplified, streamlined, and agile. A lot of adjectives that are in the I&C plan and also part of the Commission directive.

So the scope of this is forward-looking. So some of it, the items under consideration, they may be less beneficial to operator reactors, when compared to new designs. The staff recognizes this. I think industry recognizes this.

Yet, industry is still expressing interest in the broader modernization. They have members who are involved and advanced in small modular reactor designs on their team. It's just that the emphasis, to this point, under MP 4 has been on this more tactical area.

So, the main reason that industry would like a broader modernization is that it basically sees the entire infrastructure itself as too complicated and the complication leads to differing interpretations and that creates uncertainty. So, it's the infrastructure itself that is somewhat of an impediment to their adoption of digital technology.

So the goal is to improve overall efficiency while maintaining effectiveness, broader improvements that go beyond the tactical ones. We want to address the complexity of the existing

infrastructure and eliminate misapplications or differing interpretations.

So as I said before, we have been primarily focusing on the new license amendment review guidance. So discussions on the broader modernization have been limited.

Nevertheless, we are dedicated to characterizing and evaluating the entire regulatory infrastructure through a broad assessment. We want to identify what the target is for this future modernized infrastructure, get agreement on it, build consensus. And then we will have to create the more detailed plans to move from our current state to a fully modernized state.

So one aspect that Dinesh touched on deals with these MP 3 activities and an element of a broader strategic modernization. And that is somehow getting to a point where the use of alternative standards like IEC standards are facilitated.

Industry has made different proposals, including one is, I will say, radical as not endorsing future editions of 603 because they might see that that is actually an impediment to the use of alternative standards.

They want to use widely accepted

international standards, in part, because they see it as a step in the overall way for them to enable a broader safe vendor base, such as through the use of SIL, SIL-certified components.

Some industries expressed a desire for a clean sheet approach, meaning don't try to tweak the current regulatory infrastructure as part of moving to a fully modernized one because they just see it as counterproductive based upon the complexity of the existing infrastructure.

They would like the approach to increase the safety focus and remove the prescriptive nature of some of the elements of our infrastructure. I think that is -- you know improving safety focus is consistent with the Commission's directives.

So they want to enable more ready use of alternative standards. They also are very much interested in aligning how digital I&C is treated with the way most other disciplines are treated in the regulatory infrastructure.

So that gets back to this perceived impediment of prescriptive software development and quality processes. They don't see an equivalent in other areas and they -- I think industry is ready to move toward a standardized quality process under their

standard quality assurance programs, commit to it, and utilize that as a mechanism to maybe reduce -- provide an equivalent level of assurance from what is in our existing process.

So as the MP 4A activities settle out, we're going to probably more broadly engage industry in these activities, as far as evaluating the current regulatory infrastructure that's needed as a foundation for any subsequent strategic activities. We need to have a really good assessment on the current infrastructure either aligns or doesn't align with the Commission's directives about being performance-based or technology neutral. The staff knows that some elements are not and there is work to be done to get it there.

That's all I have.

CHAIRMAN BROWN: Okay. Does that complete? We're running a little bit behind now.

MR. DRAKE: This is just a close out slide. We understand we're running a couple minutes behind.

This is just a reminder that discussion for later this afternoon will be expansion of MP 2 and 1 and more for NEI 96-07 Appendix D.

And then Mr. David Rahn will come up and talk about the RIS and we'll revisit all those questions

we had earlier this morning.

MEMBER MARCH-LEUBA: I don't think we're behind. We didn't take a break but --

MEMBER BLEY: It's a continuation, Charlie.

MEMBER MARCH-LEUBA: Charlie, will you let me ask a question before the break?

CHAIRMAN BROWN: Actually, I wanted to go ahead and take the break. It was supposed to be 10:15. So where are we, schedule-wise? I thought we were only -- oh, all the way down here. I'm sorry.

Well, let's go ahead and before we ask questions, let's take a break. We'll be back at 20 minutes until 11:00. Recess.

(Whereupon, the above-entitled matter went off the record at 10:25 a.m. and resumed at 10:43 a.m.)

CHAIRMAN BROWN: The meeting will come back into order.

Before we go on to NEI, we've got a couple of questions. Jose, you want to go and then, Myron, I'll pick you up?

MEMBER MARCH-LEUBA: Okay, since I'm going first, this concept and then hearing your presentation is cybersecurity. And, I realize that

this is a different branch and probably that -- and that's probably the reason, but, any expert on cybersecurity will tell you, it's a lot easier to build cybersecurity into a system when you're designing and upgrading a system than trying to plug the holes afterwards.

And, 50.59 actually requires you to identify any new failure mechanisms. And, a cyber attack is a new failure mechanism and if something that is weak, it looks very carriable.

So, we need to emphasize that, during these changes, cybersecurity needs to be able to -- and I'm sure your teams know about it, but it should be one of the checkmarks.

MR. LUBINSKI: John Lubinski, if I can comment on that.

I appreciate the comment, our understanding and we agree with you that as, people are going through the design process, it's definitely something they need to keep in mind as they go forward.

But, I do want to clarify from a regulatory requirement, and again, this is getting in the difference between design and regulations.

As part of our license amendment process, we do not review the cybersecurity. That's done as

part of the inspection follow up and that's part of the current regulations.

That is something that, as we start to look broader under the strategic area that we will reconsider whether that's appropriate from a larger strategic standpoint in an overall regulatory structure.

MEMBER MARCH-LEUBA: Yes, I would recommend the strategic part to be included because, something like this is easy to fix when you're building it, very difficult to fix afterwards.

And, as a new failure mechanism. So --

CHAIRMAN BROWN: Okay, I'm going to amplify that based on John's comment. I can't resist.

He's a 100 percent right in that the cybersecurity aspect is a programmatic aspect under 73.1 or something like that, 74.1, I don't know, which ever one that -- whatever part it is.

However, that is -- was issued as a programmatic type thing.

The problem is, if you don't define an architecture that'll accept -- that allows you to control access, you can have all the cybersecurity you want and it sucks, it doesn't work.

So, we'd emphasize during a number of the

new plant designs because they are heavily dependent upon networks that the control of access to that network from external sources be limited to one way out, nothing coming in.

That's not a cybersecurity issue, that's a IEEE 603-1993 issue in terms of control of access. And, while 603, that version is pre-universal connectivity, the idea of control of access just expanded from just internal controls of access to how do you prevent somebody from coming in from the outside via networks?

That does not require a cybersecurity program. It doesn't require any programmatic issues. It simply requires making sure access to the plant and any new digital systems are limited to internal plant type things. After that, now you've got an automatic cybersecurity isolation point and you can work from there.

But, it doesn't interfere with the programmatic aspects, it strictly has to do with any new architectural aspects that when digital control systems are implemented, if they are given access to the outside world, if you don't have a means or a process for being able to deal with that, the last thing you want is to have a massive program, software program,

that's sitting there trying to monitor every piece of data that floats in to the system and/or the network. It'll drive you crazy.

So, anyway, I just thought I'd have the last word on this.

And, now you all have Jose's. Myron, did you have another comment?

MR. HECHT: Yes, with respect to the strategic aspects of how you do this, one industry didn't mention, but which is dealing with upgrades, is the aviation industry and the civil aviation industry and the FAA, in particular.

They do have a lot of upgrades that are put into aircraft over the course of their operating lives.

Have you considered looking at how it is they approach approving upgrades and replacement devices and for avionics and for other aspects of aircraft?

MR. DITTMAN: Yes, we're going to investigate the alternate regulatory infrastructures, both in nuclear international and other safety areas like FAA.

So, yes, we are considering that. We have done some prior research activities. So, we have some contacts in the FAA. We have some understanding how

they do it and their applicable standards.

MEMBER STETKAR: You said you're going to or you have?

MR. DITTMAN: There was some research done in the past that we can perhaps leverage in context. We haven't done any specifically under this MP4 activity.

MEMBER STETKAR: I'm just curious, I wasn't going to mention this earlier, but regulators in other countries have indeed, as you're well aware, approved substantial upgrades from analog protection, safeguards, actuation systems to fully digital systems. And, they did that, oh, in the example I'm thinking of, 26 years ago. It wasn't last year.

MR. DITTMAN: Right, right.

MEMBER STETKAR: So, there's a history there. It's not a need for research, you could go over example talk to those folks, maybe not. Maybe they don't remember what they did because it was so long ago, but there is a history of other countries having an infrastructure in place to approve these things.

And, it's not a controller for a chiller, it's full replacement of protection and safeguards.

So, I'm surprised that you're kind of thinking about maybe leveraging some of your contacts

out in the world at this late date in 2017.

MR. DITTMAN: That was respect to the comment about other non-nuclear safety domains. So, I think part of the challenge is 26 years ago, even in the NRC's regulatory information framework, there was not much details, it was a lot more flexibility. I would say less reg guides in place.

So, even in the United States, there were digital systems put in some time ago.

So, the question right now is the current regulatory framework is seen as an impediment to, you know, trying to comply with what we have now to doing that. And, we didn't even have that 26 years ago in the United States.

MR. LUBINSKI: John Lubinski, if I could add to that?

Whether we're talking about other industries like FAA or the international community.

Yes, we have already reached out, as Bernie was saying, there was some information we have documented, okay, about our analysis in the past, but we're moving forward with more in that area.

Internationally, I don't want to give the perception that we're in a silo. We do participate in international communities, IAEA, we're working with

the international communities. We are very active and understanding what they're doing and trying to adopt some of that.

But, if I could put two parts of that, and again, we're looking at that a lot with what we're doing today under the current activities as well as strategically and we think we're going to benefit a lot from the strategic area there.

But, if I can bring up two points that are some differences as you go forward and this kind of lays out some of the framework and the industry can respond maybe a little more to this.

When we start talking about things like using sill from a commercial grade dedication process, when we start to look at using some of the off-the-shelf systems, is, you know, historically the nuclear industry has always looked at one offs, right?

We've argued there's always been around a 100 active operating plants at one time. But, they all don't use the same thing and even today, when we start to look at the upgrades that are being done, you can't say that all 100 plants are going to use the same upgrade to their RPS system in the future. Right?

So, when you start to get to more of the one offs, there's a lot more difficulty from the

standpoint of the review that you do.

Even if you look in the aircraft industry and say that you don't call it a one off, even if Boeing is putting it in all their planes, right, that's not a one off. They're using it in a lot of different areas.

So, how do you balance the one off nature to the testing versus a lot of experience? We give a lot of credit when you start to look at something that's a commercial off-the-shelf that has millions and millions of hours of operating experience that can be used to show its reliability. The concern is when you start to do the one off for a plant.

The other comment is, when we start to look internationally, we also have to look at the international regulatory structures as well. And, there's a difference in the regulatory structure.

As one of the main examples that we all are aware of is, most of the international community, I'd be close to saying all but the U.S. requires PSRs to be done on a 10-year frequency. We don't require that.

And, that's where some of that's picked up along the way. So, there's a little bit, my words, maybe a higher level of assurance when we're doing our initial review because of the backfit protection that

plants have. So, we need to look at some of those standards as well.

But, again, we are actively working with the international community and trying to get those insights to help us understand what's the best things to do with the community here in the U.S.

MR. HECHT: With respect to the comment about commercial components and wide use, for 50.59 upgrades, aren't we really talking about that, those kinds of things?

We're talking about the insertion of newer generation electronic control devices and situations where they might be used and many different applications, not only in nuclear power plants.

MR. LUBINSKI: It's a yes and no to that because, again, under 50.59, there's no requirement from the standpoint of commercial versus noncommercial grade.

Even under a license amendment, it could be a commercial grade equipment, but, based on the triggers in 50.59, could require a license amendment.

It could be a one off that's done for a plant. It could still meet the 50.59 trigger and allow them to do it under 50.59.

What we're finding, for the most part, if

you start to look at a commercial equipment, commercial off-the-shelf equipment that's out there, if you're talking about it doing the limited amount of functions, having a lot of years of operating experience, I would say with what we're looking at in the risk in Appendix D, there's probably a high likelihood that that could be done under 50.59 and you could take credit for a lot of the testing and operating experience you've had in the past and that would help build your case for meeting the 50.59 criteria.

MR. HECHT: When you say high likelihood, or probably, is the intent to make that more clear in the near term or only in the longer term?

MR. LUBINSKI: Yes, to both. And, when we talk about the risk this afternoon, when Dave Rahn's talking about that, that would be a good topic to bring back up again of how does the qualitative assessment take into account things like the design attributes, the standards that they're built to and the operating experience and how that's going into the qualitative assessment of whether there is more than a minimal increase in the likelihood of a malfunction.

CHAIRMAN BROWN: I'm sorry, thank you very much.

I just had one other comment or question

I had, how long did it take to go on Diablo Canyon from the time you got the docket to the time it was approved? The LAR?

MR. LUBINSKI: John Lubinski.

The total amount of time on Diablo from the time it was submitted for review until the time the license amendment was actually issued was a total of five years.

With respect to that, a couple things that happened along the way and I want to make sure we're clear on the record is, part of that was process where we were doing communications with Diablo once the document was on the record, but we still did not have the complete package of information from them.

In other words, there was still information needed to be part of the docket as we moved forward.

Also, part way through the process, they decided to change platforms along the way. So, again, it was a major change along the way.

CHAIRMAN BROWN: Okay.

MR. LUBINSKI: If you were to follow what we did in some other areas, you may have said, don't accept the application so early. Or, at that point when they changed, you may have said, complete the

review and start the clock again and call it another review.

But, because we were trying to implement ISG-06 and get lessons learned from it, we were being as flexible as we could as part of that review.

CHAIRMAN BROWN: Okay, thank you very much.

I guess it's time now, we need to change out and I guess NEI is prepared to do their thing?

MR. REMER: Yes, sure.

CHAIRMAN BROWN: All right.

MR. REMER: Yes, so thank you.

My name is Jason Remer, Nuclear Energy Institute. And, thanks so much for allowing us to have this time to make a presentation to the Committee.

The topic is very interesting and we're very interested in the topic.

I'd like to just introduce my friends here, Vic Fregonese, NEI also AREVA; Neil Archambo from Duke; and John Connelly. They're each going to give a couple slides within my overall presentation.

I'm the Director of Second License Renewal and Digital -- or actually, New Technology at NEI. So, I've got SLR as well as the Digital.

And, I have to say, it's probably, in my

career, about 30-something years, I've never directed a project quite as interesting as digital I&C.

I was a digital engineer at Arkansas Nuclear I for about 18 years, so manager there, superintendent.

But, the kind of people you get, the kind of technology you're interested in, the kind of impact is all comes together at a real critical point here.

And so, hopefully, we can get through this and come up with a good place.

So, next slide, I'd like to just provide a little background.

Nuclear plants are critical infrastructure. Of course, you know all this, 62 percent emissions free electricity, very critical part of our nation.

We're going to be around for a long, long time. Second license renewal is going to happen. Another one of your Subcommittee's about a month or so ago, we were before them and we had a Commission briefing also a couple weeks ago and we're set to have two applications come in in the next year.

So, 80 years is going to happen, I'm sure, and maybe a 100, who knows. So, we're around for a while.

We need to be included as we think about rebuilding America's infrastructure. We're a great example of that. We have operational excellence. We're a mature industry, we know what to do. We hire a lot of smart people at our plants.

Again, I worked at Arkansas Nuclear 1. I could look at my office about 700 to 800 people work there and I could -- all I can see is the lake and the river and the trees, it was great.

A little pocket of really high paying jobs in the middle of nowhere, Russellville, Arkansas, so look it up sometime. Great place to visit.

MEMBER STETKAR: I like it in Hot Springs, be careful.

MR. REMER: Hot Springs, yes, it's good.

But, we had some challenges.

Next slide?

So, as you know, electricity demand is down, really low. A lot of efficiency improvements, we're glad for that, LED lights, I'm trying to change them out in my house, I'm sure you are, too.

But, we've got some market problems. We've got natural gas at historically low prices, fracking has worked.

Solar and wind are continuing to expand

thanks primarily due to federal and state tax policy support.

And, our markets, our electricity markets just are not set up to recognize the true value of nuclear.

Baseload always on, non-emitting, fuel on site. There's -- I could go on and on and on why we need our nuclear plants to be part of our national infrastructure.

Plus, our costs, even at the very best performing plants, sometimes are challenged. As you know, we've seen plants shutting down for no other reason other than market pressures.

Next?

But, we've got a future. If you look out ahead, people are really excited about advanced reactors, SMRs, I think are going to happen.

Hopefully, new light water reactors are happening around the world and hopefully will happen here.

And, we have second license renewal. So, we have a slow period in front of us that tells us we need to keep these plants operating at peak performance.

In order to do that, we need to apply the

most modern technologies to our plants.

As far as I know right now, all our existing plants have their original analog RPS or SFS system except for one. Or, they're using a first generation digital system.

That's -- I think that's an accurate statement.

Oconee has replaced theirs, but that's it. So, we've got tons of digital systems that are secondary system, but our primary systems, our safety systems, are still, I'm going to call them retro, classic. They're still working, they're still safe, but they're old technology.

So, we've got with second license renewal, we have some time in front of us to pay for these upgrades. My vision would be a complete digital plant for every single unit we have operating in the United States, not just the new plants.

You look at these advanced reactors, SMRs, light water reactors, they're all digital, of course. Everything around the world, somebody referenced, you know, it's all digital. I think you've got several major projects going on in Europe right now.

So, we have some opportunities, let's not squander those opportunities.

Next?

The case for implementing digital I&C, it's a relatively easy case. It does improve plant safety, reduces transients, reduces challenges to our safety systems. It does improve efficiency.

I remember I worked at an A&O and Unit 1 B&W plant, to start the thing up with an analog feedwater system, you had to bring in a couple special guys. And, they were really concentrating. You know, somebody said, they're smoking cigarettes and drinking coffee trying to get it up past 20 percent. That was a major challenge.

We put digital feedwater in 25 years ago, 30 years ago, you know, you just punch the button and it goes up. And, that's the same experience we've had across the entire fleet.

The reliability and efficiency improves greatly.

Most of our changes that we've made to secondary systems reduce or eliminate single point vulnerability, so the plant doesn't trip as often.

Systems don't go down as often. They actually report when they're going down. And so, they tell you, I'm failing or I've failed, fix me.

Whereas, an old analogue system, it tells

you after it's already failed.

We manage component obsolescence. So, you know, that most of these systems, if not all, are all obsolete years and years and years ago.

Helps our business case for 60 years, going greater than 60.

In the LE, I mean, if we were sitting here trying to convince you or convince the NRC based on poor operating performance, we should go home.

We've got excellent operating performance through digital systems that we've put in. That's why we continue to put them in.

The one safety system that we've replaced in Oconee has gotten excellent operating experience. It was a very difficult project, but right now, the operators love it, it works very well. There are no problems.

Next slide?

Critical actions, what's going on here? We've -- I know you've had some briefing on this already.

There have been at least one other previous effort, maybe a couple. It helped some 10 years ago. But, I think it fell short overall in providing a reasonable and efficient regulatory process for

installing digital I&C equipment.

So, a couple years ago, the industry chief nuclear officers, the ICNO group, commissioned a digital I&C working group which all these gentlemen are members and also many other members across the nation in late 2015 to say we've got to get a handle on this project, this problem.

So, we proceeded to work with our industry and also work with NRC, the Commissioners, they instructed the staff after reviewing the 603 document that we needed to modernize the digital I&C infrastructure in SECY-16-0070.

That allowed us to work together with the NRC staff to develop this action plan which I think is a very, very good document and we're working aggressively with the staff to break down barriers.

Just a note, we're really looking for a step change here. We don't just want a tweak or a minor adjustment. We think we need to kind of clear the deck, figure out what we need to do and actually do it.

Next slide?

Current state of digital, this is just a little repeat of some of the stuff I've already said.

You might think we're not doing digital at the plants. We are doing a tremendous amount of

digital work at the plants. It's all in the secondary systems, though.

The non-safety systems are being aggressively replaced all over the board.

Mostly turbine control, feedwater control, reactor vessel level control are very common.

I think there's maybe only one plant that's still got non-digital feedwater out there somewhere. They're not many, mostly been replaced.

On the one digital protection system, however, and one project that has gained approval, but is on hold, and I want to -- that five years, I would just want to say right here, we take credit for two -- at least two of those years of delay. And so, that's on us.

And, I hope you see through this also is that we're not -- we have got to do our part as the industry to make sure we're operating these plants safely. We put in mods that are safe and that are right.

I told somebody, I forget who it was, you know, we could operate all these systems with a Nintendo if we needed to, but that's not what we should do. We should get the right systems to operate our plants.

Regulatory guidance was not clear or lack

of common understanding on certain issues. There were issues on the 50.59s. We used to be able to put in a lot more digital mods under 50.59 than we can today.

There's been a couple 50.59s that we, as the industry, didn't do so well on that highlighted some issues in digital and it's creating an effect where most of our licensing staffs are very, very nervous about putting in any kind of digital modification.

And so, we're very careful right now and we're very reluctant. And, you'll hear more about his as we get into the further presentation.

So, 50.59 screening is one big area. Digital common cause failure, another big area.

CHAIRMAN BROWN: Can I interrupt you for a second?

MR. REMER: Please.

CHAIRMAN BROWN: You said, in the first bullet up there, you say you're being non-safety systems are aggressively being replaced and you listed a whole range of things that you all dealt with.

MR. REMER: Yes.

CHAIRMAN BROWN: But, then, you go on to say later that everybody's very, very nervous about doing any digital upgrades.

Does that mean --

MR. REMER: For safety systems.

CHAIRMAN BROWN: Oh, for safety systems?

MR. REMER: Yes, for safety systems.

CHAIRMAN BROWN: Okay, all right.

MR. REMER: Yes.

CHAIRMAN BROWN: I didn't hear that clarification.

MR. REMER: Yes, sorry about that.

Yes, for non-safety systems, and we realize that, you know, sometimes you do a feedwater impact versus the chiller impact, I mean, you have to know the feedwater's going to be more of a safety impact than a chiller.

But still, yet, we have this sometimes artificial structure right now where we're able to replace one thing but not the other.

And so, you know, they're very actively being replaced. And, of course, you have to do 50.59s on all of them. But, for safety related systems, all right, it's very difficult right now to get a change through.

So, there's that. There's also the common cause failure which we believe we're going to be addressing in 16-16.

And, there's also the clarity for

development and review of LARs for bigger systems that come in, major system replacements, that's going to be addressed in MP-4.

So, the result, regulatory uncertainty leads to perception of high risk and creates barriers to implementation of safety system digital upgrades.

Next?

We made considerable progress with the NRC and the digital I&C working group. At least, in the action plan, we've been involved in the action plan from the very start. We've had a major role to play in helping put that together and provide comments. And we thank the staff for that.

We're going to be talking more about getting a hold of how you think about common cause failure. And, that's what NEI 16-16 is about. You're going to be hearing more about that today.

But, that is a key issue that, if we can't get through that, we can't really go forward.

The risk document will allow us to address this lower safety significant safety related mods that we think we can do and we have many designs on the shelf ready to go. And, Neil's going to be talking about that later on.

And, we appreciate the flexibility of the

staff to produce something so quickly to let us be able to do that.

We are looking forward to the approval of 96-07 Appendix D on 50.59.

And, also, a review to help us contemplate, as you know, if we contemplate replacement of major controls -- major safety system, it takes years and years to work all that through.

So, the time horizon here, the sooner we can get this LAR guidance hammered out, the sooner we can start cranking it back into our plant scheduling systems and design systems so we can start actually contemplating some of these replacements which may of them need to be replaced badly. So, you'll hear more about that in a little while.

The other thing I want to say about this is, if we can actually use the risk to replace some non-critical safety systems and get some history with that, we think that will provide additional confidence that utilities will be more likely to consider replacing their major safety systems.

We'll show some confidence in the regulatory process even though it's not exactly the same one.

So, with that, I want to turn it over to

Vic Fregonese. Vic is Senior Manager at AREVA. He's a long time digital I&C engineer, been working with this -- you were like Ground Hog Day, right, you were on the last one of these as it went through.

MR. FREGONESE: That's right.

MR. REMER: So, he's also loaned to NEI for a couple years to help us hammer this thing out. A couple year, right? Three years is what it said, right?

MR. FREGONESE: We'll see. I think it's one year.

Well, thank you. So, once --

MEMBER STETKAR: Hold on a second.

MR. FREGONESE: Yes?

MEMBER STETKAR: Jason?

MR. REMER: Yes?

MEMBER STETKAR: You know, I'm a risk guy by trade and one of your slides says that a critical action, this must be a step change and not a minor adjustment to current policy to be successful.

NEI just had a Commission briefing on, let's see, what's the title of NEI's slides here? May 11th, on use -- sustainable use of risk informed regulation to improve plant safety.

Notably missing among that briefing was

any mention whatsoever of digital technologies. Why isn't the industry taking a leadership role here on using risk information to support these licensing issues?

MR. REMER: It's a great question. Greg, I wonder if you want to come and address that?

We started out, I think, in a place where we -- risk wasn't as big a factor because we were more of a deterministic approach to this.

But, as the time has gone on these last couple years, we've definitely seen that risk needs to be a part of that. And, the staff, I believe, is more open to considering that.

MEMBER STETKAR: Jason, let me --

MR. REMER: Yes?

MEMBER STETKAR: I haven't read Draft 2 of NEI 16-16, but if that's a watershed document for addressing common cause failure, at least the Draft 1 that I saw explicitly says that it does not consider risk.

MR. REMER: Right.

MEMBER STETKAR: Risk will be considered sometime maybe later kind of sort of.

MR. REMER: That's right.

MEMBER STETKAR: So, where is the

industry's leadership role here?

MR. FREGONESE: I'll make a brief comment.

We submitted Draft 2 and we engaged Greg who'll introduce himself to provide us with some risk insights as part of that document.

So, we realize that area needed to be expanded upon and I'll Greg go ahead and tell us what --

MEMBER BLEY: It is expanded in Rev. 2?

MR. FREGONESE: There is a state -- there is a section on that that was not in there before. It did exclude risk previously. It does not now.

MEMBER STETKAR: Good, great.

MR. KRUEGER: Good morning. My name's Greg Krueger, I'm an Exelon loanee to NEI, former Director of Risk Management for eight years at Exelon, so well informed with regard to, you know, risk informed applications.

This is a deterministic framework and we did add in this latest revision a vision of how to use risk in characterization of common cause.

It is not a Reg Guide 1-200 or a Reg Guide 1.174 application.

So, the term risk informed implies some of those elements.

We're not asking the PRA or the PRA

community to bring that level of sophistication into the evaluation of common cause. But, we are saying, use the PRA as a tool for risk insights, functional insights in terms of combinations of failures that could occur that one might consider when developing a digital system.

MEMBER STETKAR: Okay, I look forward to seeing what it says and I hope there's some substance there.

I'd just like to -- because, you know, I do have the risk thing stamped in my forehead here, I'm certainly not advocating the -- I'll be quite blunt, electrical engineers are not the kind of people that you need thinking about this stuff because they tend to be so small mired in the details that they don't see the big picture.

I do have an electrical engineering degree. I can then say this.

I'm not advocating the be all and end all risk assessment of a digital I&C system. There are a lot of problems that we're all well aware of.

On the other hand, there have been many, many successful uses of risk information for licensing decisions in the past that have not needed a so-called Reg Guide 1-200, fill in all of the perfectly square

boxes with perfectly black or white input out to, you know, 17 significant figures.

That, indeed, the Agency, if they're willing, if the staff is willing, to think that way has been able to reach a conclusion of adequate assurance, reasonable assurance of adequate safety.

And, I'm just kind of challenge you, you know, to try to take the leadership here so that we don't have this discussion ten years from now with people still worrying about how likely is that common cause failure that nobody knows what it is.

MR. REMER: Mr. Stetkar, thank you for that comment and I will take your challenge and I will -- do you mind if we quote you and we will --

MEMBER STETKAR: It's on the -- this is a public record.

MR. REMER: It's transcripted so it's already quoted.

But, thank you for that and we fully agree with that and the staff has definitely been open to considering that and we're in an evolutionary process to incorporate that.

Thank you.

MR. FREGONESE: Thanks for the comments.

And, actually this considerably slowed

down our issuing the revisions. So, we spent a lot of time on -- several hours on the phone with Greg and other PRA people that contributed.

So, once again, I'm Vic Fregonese leading the MP 1 efforts on the NEI side. My other -- yes, sir?

CHAIRMAN BROWN: As an electrical engineer who has a very small mind and is always mired in the details, aside from risk, I've tried to come through, well, I agree and I've -- for the last nine years, I've listened to risk from John and Dennis extensively which, and I agree with a good bit of it.

I also have tried to differentiate between systems such as single function controllers or other type devices that we imply -- that we incorporate digitally into the plants.

And those where redundancy is required in order such as the reactor protection of safeguard systems.

So, I tend to differentiate there because common cause failure problems are significantly reduced when you have redundant systems operating in parallel and doing things.

So, I have a hard time coming across with what's performance-based mean or what's risk-based mean when I'm looking at independent redundant-based

systems.

So, I just -- I've never seen a differentiation. I have a full -- not understanding but agreement that, when I've got single function controllers doing things, starting pumps, operating support systems or what have you, risk is a useful tool in looking at the complexity and other factors of failures that you can have.

Not that you wouldn't use it for the individual redundant systems or channels, divisions in these other safety systems.

And, I've never -- I've read 16-06 Rev. 1 -- no, 16-16, excuse me, and I get -- I saw nothing relative to risk in there detail wise on the risk. And now you're saying it's going to be cranked in.

And, I just want to make sure we don't lose focus on the critical nature of independence for those critical reactor safety systems that we have to deal with, that's all -- that are fully redundant.

MEMBER STETKAR: I will, and I have to say this on the record, having done numerous risk assessments of analogue reactor protection and safeguard systems, with very detailed models, they are almost totally dominated by common cause failures of those nice redundant so-called independent relays in

multiple channels.

CHAIRMAN BROWN: And, I'll add --

MEMBER STETKAR: That is the most important contribution to failures today on the --

CHAIRMAN BROWN: On the analysis side.

MEMBER STETKAR: On the risk informed of what is important to plant, failure to trip the reactor or failure to actual safeguards.

It's -- so, just saying that we are replacing that good old analogue click, click, click stuff with that nice silent mystical digital stuff and that the digital stuff is prone to common cause failure ignores the fact that common cause failure of the old analogue stuff is indeed the most important contribution to its failure.

CHAIRMAN BROWN: Okay. Well, I will make -- we love to go back and forth, that's the value of having these --

MR. FREGONESE: Yes, it's really a conversation.

CHAIRMAN BROWN: -- thought processes, but -- and, I will say that, after -- and I will have to speak for my experience of 35 years in managing all the naval nuclear plants, 180 plants at one time with analogue systems and then conversions to digital

systems and developing all those specs and standards that, in the 22 years when I -- I never had a common cause failure take out a single one of our naval nuclear protections systems, not one.

I never had -- once I got digital systems in place, the reliability of the analogue systems that we used to have paled in comparison to the digital systems that we had.

Not that there couldn't be -- not that we didn't identify problems that we had to fix software wise, but I sometimes think the analysis of common cause failures, while valuable, can be overplayed.

So, that's probably a heretical statement but that's just based on experience, not based on any analyses because we didn't do these analyses back then.

So, I'll provide -- y'all can see, we have unanimity of disagreement on many of these things on the Committee, but that's fine. That opens up for good discussion.

MEMBER BLEY: Well, the idea that common cause failures only show up in analysis is kind of -- no, it's not true.

MEMBER STETKAR: It's not true.

MEMBER BLEY: It shows up in the data.

(SIMULTANEOUS SPEAKING)

MEMBER BLEY: And, it's first -- it's analyzed before it happened and identified.

MEMBER STETKAR: Yes, that's actually that's true.

MR. FREGONESE: I'll proceed then.

CHAIRMAN BROWN: Yes, you can proceed.

MR. FREGONESE: And, this is why Greg was a great help to us because my background is in I&C engineering and not a PRA person. And, they talk a special language and I'm glad there's people that understand the receiving part because I rely on his experience.

Once again, I'm Vic Fregonese, I've been working on loan to NEI full-time. I'm going to provide only a couple of slides which will give the industry view.

If you ask me some questions, I will give my best answer. If it's an opinion, I'll let you know because the opinion will come from someone who installed the first digital safety system in 1985. I was a startup engineer at Waterford 3 and Shearon Harris and worked for Baskin in those days, a long time ago.

And then, spent 15 years in the operating fleet doing the first digital feedwater system and a variety of other mods.

And then, 15 years with AREVA. And, of course, worked on the Oconee project and have a lot of insights as to the international experience.

About 40 different plants, we have thousands and thousands of these systems, components installed all over the world. So, there is a -- some of those responses may come from that viewpoint.

With respect to MP 1, we've been very active with the NRC. We've had so many meetings, I can't even fit them all on one slide anymore. So, as you saw, we're up to two slides of meetings.

They've been very productive. And, a lot of it was kind of the norming, understanding what we needed to understand and what problems needed to be solved. We spent a lot of time on that and relied on industry colleagues like John and Neil here to provide some of the real data that they're seeing at their sites.

And, our near-term goal really became clearer after we had some of these meetings about what was needed say, by the summer. And, that's evolved into the risks and also this NEI 16-16 document which I'm going to talk about now.

We submitted Revision 2 on Friday and it includes an appendix from the EPRI document which

you've seen before. You've heard the Ray Tork (phonetic) presentations on this larger EPRI document which many of us worked on that were part of the industry.

We include the Appendix A which we're calling Defensive Measures. And then, within NEI 16-16, there's a lot of dialogue about, you know, with a flow chart and so forth about how to do this technical work which we may call a qualitative evaluation.

And then, that feeds a separate process which is the 50.59 process. We take the results of that assessment and do something with it in licensing space which is either you proceed and implement it under 50.59 or, in some cases, you know, an LAR is required and we go ahead and submit it.

So, the Draft 2 is submitted for review and we look forward to some upcoming meetings. I know the staff probably hasn't even had time to look at it. But, I feel like the Appendix A is something that's been out there for probably a year at this point and there should have been opportunity to review some of the details there.

MEMBER BLEY: I asked the staff this earlier.

MR. FREGONESE: Yes?

MEMBER BLEY: And, they suggested there would be exercises, tabletop exercises on 16-16 at some point in the future.

MR. FREGONESE: Yes.

MEMBER BLEY: I assume that'll be on Rev. 2, but I'm not sure of that. And, how important do you see those exercises as far as moving this process forward? And, when do you think those are likely to happen?

MR. FREGONESE: So, I'll try to answer your questions in sequence.

I assume it'll be on Rev. 2 also. That would be the proper thing to do since that's the new revision.

And, they are very useful. We had some early discussions about this chiller example. In fact, we had so many discussions about it, I think that we never want to talk about chillers again maybe in some of these meetings.

But, it was a simple example to understand and you'll some real life stories. In fact, I did a recent SIS visit with INPO at a site that's upgrading chillers or trying to and struggling with some of these questions about common cause failure trying to give them some insights.

So, we will do a tabletop or probably several tabletops to walk through the different phases of the evaluation.

And then, start working through the defensive measures which you may call design attributes, something simple like having, you know, separate power supplies or having a UPS. It sounds very straightforward.

I was involved with some Woodward 505 installations where we didn't do such a good job and had a poor quality power supply which the Woodward governors said, well, we're going to have poor quality, I'll just shut off.

And so, we had loss of both feed pumps at the same time when I was in Salem and the operators were not particularly happy with the engineers who did the mod.

Now, was that a common cause failure? Yes. What was the cause of it? We didn't read the vendor manual where it said, you know, use a good power supply.

So, my experience with these is that the interfaces are really important. Meaning, environmental interfaces, the power interfaces, the NEMIR environment and things like that are designed

precedence to cover that. But, it's a learning experience.

So, that's a simple example of a defensive measure.

Then you get a little bit more complicated. And, the reason why this is important to the industry, and I'll let John and Neil comment on this later, is that the so-called default defensive measures, diversity and 100 percent testing, they don't really work too well in the real world.

Diversity is a -- hasn't worked on the Oconee project and hasn't worked on a diverse actuation system design for new plants. It has its place, I believe.

It does add a complexity in some cases. But, it does provide an additional level of assurance.

For most of the upgrades we're seeing at the plants, I think that's probably not something that makes a lot of sense.

So, the Appendix A offers different approaches to design these defensive measures. And that was based on input from a lot of people, suppliers, end users, industry experts, people outside the nuclear industry. And, you've heard the story from Ray.

So, we look forward to discussion on

Appendix A and how that fits into the qualitative assessment process.

We'll next talk about the risks. This has been a fast moving train. It started in March and I think John mentioned, it was pretty impressive.

We were impressed with the speed at which it moved to the point where we almost couldn't keep up. So, we spent a lot of time looking at the variety of drafts.

And, we had a couple of really good meetings and workshops on there where Neil, I believe, provided some real 50.59 examples from some of the sites at his utility to discuss and see how we would go about addressing those.

We also went through a list of systems. We brainstormed a list of systems in the meeting, you know, typical plant systems, you don't like to go by name because they're called different names at different plants, but kind of, hey, what functions, you know, chillers, HVAC, post absent monitoring recorders, digital devices, digital breakers.

And, we kind of went through and kind of categorized those whether this was something that really is going to be done.

And then, also, hey, what's the kind of

pucker factor that we hear about the RPSS FAS, hey, is that something that throws a red flag up? Is it something that requires more investigation? And, can you really handle that with a qualitative assessment

We reviewed in detail the April 20th draft that we got which was expanded. And, we spent a lot of time on the qualitative assessment guidance and provided a bunch of comments back just in time to support the work on the FRN version which is forthcoming.

To answer a question earlier about the tabletop next week, that tabletop is very important. Our intent is to go over our comments that were submitted. And, we have another example that Neil and I working on which will take one of these 50.59 evaluations and try to put it within the framework that's in the risk attachment to see how it works.

Now, we have not seen the new risks and so, next week's meeting may be a little bit more interesting than we thought in terms of discussing the deltas between the previous version and the final version.

But, we're anxious to stay engaged and we're anxious to discuss this qualitative assessment guidance a little bit further.

So --

MEMBER BLEY: So, you'll get to see it when you walk in to the meeting?

MR. FREGONESE: No, no, no, absolutely not, no. The way we've been working with the staff is, when that document becomes available in ADAMS and we'll get a copy immediately from Jason Drake, Project Manager and then we'll distribute it to our users.

Once it's something that is in the public domain and --

MEMBER BLEY: I might be missing something. Today is Wednesday and you said this is next week?

MR. FREGONESE: Next Thursday, yes.

MEMBER BLEY: A whole week, okay.

MR. FREGONESE: Well, yes, in nuclear time that's, you know, that's not a bad amount of time, a week.

(LAUGHTER)

MR. FREGONESE: So --

MEMBER BLEY: You're pretty sure you'll see it before you show up?

MR. FREGONESE: We read really fast.

MEMBER BLEY: Okay, that's what I wanted to hear.

MR. FREGONESE: I think the concepts have

something -- are something that we've really spent a lot of time discussing. And so, I don't expect any surprises about the concepts.

In fact, some of the things that we had most of the comments on were things that were removed from the risks.

So, Dave's comment about incorporating comments was, well, that's easy because that paragraph's gone so we don't have to worry about those comments any more.

But, we look forward to talking about, not really the comments, but how the structure fits into the qualitative assessment process, which is really part of what's in 50.59 is using qualitative assessment exert judgment in some cases to say, yes, what is the real probability or likelihood -- I don't want to get into those words, because there's a whole bunch of specialized wording about discernable versus, you know, attributable versus, you know, minimal and there's experts on that and I'm not one of those.

We have Kati over here who's our 50.59 lead for NEI and they can answer those questions.

So --

MEMBER STETKAR: If you can define credible, that would be good.

MR. FREGONESE: We have a definition of not credible, so I guess by default --

MEMBER STETKAR: Yes, it's --

MR. FREGONESE: Yes, we've had a lot of discussion about --

MEMBER STETKAR: No, not credible is not -- it's a really convoluted logic there that I couldn't fine. Anyway, that's --

MR. FREGONESE: And, one other question, I did take some notes earlier, we talked about the May 25th meeting. So, yes, that's very useful and we're looking forward to that.

I did hear a comment from Member Bley about the ISG experience which I was involved with. And the ISGs were something we were very anxious about and very excited about.

During the, I'd say, the heyday of the new plant applications that were coming in, because I worked on the EPR application and I worked on real design for our -- trying to harmonize our architecture internationally, which, of course, is almost impossible because of the different regulations.

But, I will say that one of the interesting things about the ISGs is the guidance takes all kinds of different forms. It could be an ISG. It could be

an RIS. It could be a BTP. It could be an SRP. It could be, you know, whatever.

And then, there's Reg Guides. And the Reg Guides are really the regulation. And so, one of the things you see is, and Bernie talked about this, the infrastructure consists of a lot of these different kind of alphabet soup documents that aren't really durable.

And, I think one of the things we heard from John is he's very interested in working with the industry on durable guidance which means that something that can last for a while that can't be really changed so easily.

The ISGs, many of those were incorporated into the standard review plan.

MEMBER BLEY: Not picking an argument with you --

MR. FREGONESE: Yes?

MEMBER BLEY: -- but just to clarify our record. The Reg Guides are not the regulations, they are the guidance. But, what you meant was the formal guidance, the approved guidance.

MR. FREGONESE: That's correct. Thanks for that correction, they're not the regulations.

So, but, in the end, the guidance takes a

lot of different forms. And, a lot of that's guidance for the staff.

So then, the question is, where does the industry go? Where do the engineers at the site go for their guidance? And, that's why we're working on some of these other documents that will have kind of the technical view and then hopefully the BTP-7-19 which is Rev. 7 will somehow eventually catch up.

So, that's a big job. At the end, I think Bernie talked about that. But, that's why this near-term guidance with risks is very important. And the more durable guidance which would be Appendix D and the NEI 16-16 are equally important that are, you know, following right behind that.

So, that's all I have to say about the risks. If there's any other questions about the risks or the NEI 16-16, I'll be happy to take those.

MR. REMER: All right. So, I'd like for you to hear from Neil Archambo from Duke. He's a Senior Engineering Specialist at Duke.

He's responsible for reviewing each and every digital mod and 50.59 from Duke. So, he gets all the traffic.

So, I wanted you to hear his perspective on kind of the issues at the plant today, right now,

that people are having and why this initiative is so important and critical.

So, Neil?

MR. ARCHAMBO: Sure.

MEMBER BLEY: Neil, before you start, because I've glanced through your slides a little, I know these are examples of things that are important to you folks.

But, there are also some examples that I think you've discussed in public meetings until now. And, I don't know if they are things that'll end up in some of these tabletops or if they've reached resolution.

And, if you can comment on that as you go through them, I'd appreciate it.

MR. ARCHAMBO: Sure, absolutely.

Yes, there's -- I'm going to go through a couple of examples, real life examples that are really on the proverbial shelf right now. It is waiting for this new guidance to come out that hopefully can, you know, pry them off the shelves so we can install these things.

One point to note on both of these projects is they were initiated. They were designed. The commercial grade dedication is necessary for each

project was completed prior to 2013.

And, I only bring that up because it was around late 2013 when the digital issue kind of really hit the industry.

You know, as Jason had said, we've been doing digital upgrades for better than 25 years, the industry has been.

It was late 2013 when the brakes were hit on the digital upgrades as far as utilities. And, that really wasn't just safety related, that was not safety as well. We can talk about that a little bit.

So, these two project --

MEMBER BLEY: These did make it all the way through the dedication process?

MR. ARCHAMBO: They made it all the way through the dedication, the engineering change back is complete, ready to install. Ready to install and then the decision, after December of 2013, was to let's hold off on installing these things because we don't know, due to the regulatory uncertainty.

CHAIRMAN BROWN: Was that the licensees decision?

MR. ARCHAMBO: The licensees made that decision because these were both done under 50.59, the projects. These are not license amendments.

And, the concern being is, if we install them and we have to assume a common cause failure that then we might be in trouble. We might have some regulatory issues that would need to be resolved.

So, we put them on a shelf for now. And they remain on the shelf to this day.

CHAIRMAN BROWN: So, you didn't have specific issues, but anticipated?

MR. ARCHAMBO: That's correct, that's correct, inspection issues.

CHAIRMAN BROWN: Was there any inspector involvement in the designs? When you say they were on the shelf and ready to be installed, did anybody other than the licensee have seen those?

MR. ARCHAMBO: No, no, just followed the normal design process.

CHAIRMAN BROWN: Okay.

MR. ARCHAMBO: Went through the 50.59 evaluation.

CHAIRMAN BROWN: But, you hadn't presented it. It hadn't been issued or hadn't been submitted to NRC for -- or you decided not to go forward?

MR. ARCHAMBO: No, it was -- followed a 50.59 evaluation process and determined through that process that we did not need prior NRC review or

approval.

CHAIRMAN BROWN: Yes, I got that.

MR. ARCHAMBO: Now, what happened was, it's really an issue of common cause failure and we can get into more of those details as deep as you'd like.

But, the other issue was, I just wanted to give the mood of the industry for these two projects as to, you know, why this new guidance is so important to us.

You know, our control room chillers are giving us a lot of problems. The old analogue systems, you can't buy these things anymore. If you want to go out and buy a new chiller, it's going to have digital controls.

Now, we didn't want to replace these chillers just because of the controls. There's other, you know, technological advances in chillers that would be very beneficial and more reliable.

But, they come with digital controls. And you have to go sending them through the commercial grade dedication process, of course, to get them qualified to install in a safety-related application.

All that was done. It's a very expensive process, it runs millions of dollars. You know, can take upwards of a year to 18 months to get it through

that process.

The only other option that we could investigate was to have a vendor come up with special analogue controls for these devices.

Well, now you've got a one of a kind analogue control system. And, unfortunately, with the new technology of the chillers, it really needs the digital control. You really can't do it with analogue controls.

So, that was the optional licensee, is we either go with some type of analogue controls or we go with the digital controls and then we have to fight the regulatory uncertainty.

So, we did investigate the analogue controls and, I'll be honest with you, that's still being investigated. I don't want to leave you with that's being taken off the table.

Today, in most utilities with the chillers, and I hate to talk about chillers, you know, Vic set it up pretty good. He said he's sick and tired of hearing about chillers.

MR. FREGONESE: Oh, I'm not. I like to hear it.

MR. ARCHAMBO: The first example is chillers.

(LAUGHTER)

MR. ARCHAMBO: But, anyway, most sites, they're on the shelf, they're not planning to install them yet until we get through this regulatory process.

I know of one site that actually installed one train because, of course, if you install one train digital and one analogue, obviously, you don't have a common cause failure issue.

Now, that was the first example.

MEMBER BLEY: At least not saying common cause issue.

MR. ARCHAMBO: Correct, correct.

Next slide, please?

Now the next example is on our EDG emergency DC generator voltage regulators. You know, we have most of our diesel generators are still using the old analogue voltage regulators. I believe it's a Bazzler. It's they're pretty old systems.

They -- hey, they've served us well but they're getting harder and harder to find parts for these things.

But, one component on that voltage regulator is a motor operator potentiometer and it's sole purpose in life is to provide a resistence to the voltage regulator so it knows, you know, what the output

voltage is. And, in our case, it's 4160 volts.

You know, this -- it's an actually a motor. We've had a lot of issues with it. There's an EPRI report I referenced on there that was actually issued in December of 2005 that, you know, made the statement that the best signal lowest weakest link, you know, in a voltage regulating system.

So, we have an EPRI report that says, you know, you might want to consider replacing these things. And, the EDG voltage regulator manufacturer agrees. They said you really should replace these things.

And, the only thing available is a digital reference adjuster.

You want to hit the next slide, please, Vic?

MR. FREGONESE: Sure.

MR. ARCHAMBO: So we -- again, this project went through. We commercial grade dedicated the digital reference adjuster and the first bullet there you'll see is, I just want to show you, it's a really simple device.

You know, at maximum, it has two inputs and one output. When the diesel's in the emergency mode of operation, that really just has one output, it

doesn't accept any user inputs.

And, you know, there's 17 lines of code that executes. It's a pretty simple device. It just produces a static resistance value and that's it.

The motor operator potentiometer has an uncertainty of about plus or minus 10 percent. This digital reference adjuster is more in the line of about a tenth of a percent. So, there's a lot more accuracy, a lot more reliability.

But, we're at a point, if we were to install that on both of our diesel generator trains and we have to consider common cause failure, you know, it puts us in a whole different ball game.

We cannot meet the 50.59 requirements and we'd have to come in for a license amendment to install the project like that. That's the nature today, that's where we're at.

And, that's why we're hoping this guidance that comes out soon will allow us to get these things to where we can install them.

MR. HECHT: You said that there were 17 lines of code in this DRA.

MR. ARCHAMBO: Right.

MR. HECHT: Why couldn't you subject that to an exhaustive test situation?

MR. ARCHAMBO: We did. Right now, our options are 100 percent testing or diversity.

Now, this application would not be very good for diversity, right, because we've got a Bazzler voltage regulator. This is a Bazzler digital reference adjuster. So, clearly, we don't want to find some other manufacturer, if they make one, to put on the other trains. So, diversity is kind of off the table.

Now, what the utilities are getting from the regulator is, it's impossible to do a 100 percent testing of code, even in 17 lines of codes, whether it be 17 lines or 100,000 because there maybe some type of infinite number of internal issues that are going on with that that you can't possibly test.

MEMBER BLEY: I guess I need to ask the staff at some point, but not right now, I don't want to interrupt the flow other than to say, the diesels themselves have common cause failures.

MR. ARCHAMBO: That is correct, that's correct.

MEMBER BLEY: I don't understand this at all. I don't see anything -- I don't think there's anything in 50.59 that calls out common cause failures directly.

MR. ARCHAMBO: Yes, it does. Actually, Criterion 6.

MEMBER BLEY: Six? I've got to go back and look again.

MR. ARCHAMBO: What it calls out is, if you've created a malfunction with a different result than previously evaluated in the FSAR, previously describe in the FSAR.

MEMBER BLEY: I already have a pretty good contribution of common cause failure just from the diesels.

MEMBER STETKAR: No, that's because the FSAR, by law, says the two diesels can't fail. Remember? The FSAR only says one and only one always fails.

MR. FREGONESE: Except for station blackout.

MEMBER STETKAR: Except for station blackout. Except for the things that have actually happened.

MR. ARCHAMBO: I think a better --

MEMBER STETKAR: Than other things can't happen.

MR. ARCHAMBO: I think a better example to explain to you is the chiller example because, right

now, if you look at a licensing basis, in a lot of FSARs, it'll say, what happens if one chiller malfunctions?

And, there's an FMEA table that evaluates a lot of pieces of equipment, but in all cases, 100 percent of the cases, if one chiller malfunctions, the other chiller starts. That's what it'll say in your licensing basis.

MEMBER STETKAR: And works perfectly forever.

MR. ARCHAMBO: And now, if we were to put in both trains with digital controls and we can't a 100 percent test it, and we don't want to use diversity for obvious reasons, then we have to assume that it has a CCF. We have to assume that they're both going to fail at the same time. That's the current regulation or the current inspection guidance that we're getting.

And, we can't do that and answer yes or answer no to Criterion 6 of 50.59, that becomes a yes answer. That's a different result that what's previously described in the FSAR. That's where it runs into the problem.

CHAIRMAN BROWN: When you say question 6, I tried to find question 6, is that Roman Numeral VI under C2? 10.59 --

MR. ARCHAMBO: Have you created a

malfunction with a different result?

CHAIRMAN BROWN: Yes, this creates a possibility for malfunction of an SSE important safety with a different result than any previously evaluated in the FSAR.

MR. ARCHAMBO: That's correct. That's right.

CHAIRMAN BROWN: Is that the one?

MR. ARCHAMBO: That's it.

CHAIRMAN BROWN: Okay. When you -- so, when you use the numeral six, I couldn't find numeral six. And so, I started searching for Roman Numerals.

MR. FREGONESE: Even though you have the antiquated somewhat unreliable MOPs that are on both diesels now when you put the more reliable better DRAs on the diesels, then you have to enter the space.

MEMBER STETKAR: Charlie, it's the -- it's why I rail at this stuff because the -- according to the rules, you cannot have common cause failures of relays in multiple divisions, according to the rules.

CHAIRMAN BROWN: Even though they happen in the world.

MEMBER STETKAR: Even though they have happened in the world, according to the rules, they do not happen. But, if you now insert a digital system,

the rules apparently require you to consider that common cause failure or at least the staff's interpretation of the rules which is just absurd.

MR. CONNELLY: A probability of one.

MR. ARCHAMBO: It's not a reliability issue question two of 50.59, question one or two is about reliability and dependability and quality.

Clearly, the digital reference adjuster is a higher reliability than the motor operated potentiometer, clearly. So, those questions are easily answered.

I have not increased the likelihood of a malfunction by doing this project. But, when I get down to question six, I run into problems.

MEMBER STETKAR: Because somebody says that you now have introduced a new failure mode that it's not analyzed in the past, despite the fact that it should have been analyzed.

MR. ARCHAMBO: That's what --

MEMBER BLEY: This isn't something we can solve here. But, I'm rooting it right now and boy, that's a strong interpretation to put on these words given that those failures exist already in an analyzed system, even though they didn't analyze the effects of them. We're really dancing on the head of a pin here.

MEMBER STETKAR: But, see, that's the notion of taking a lead -- I'll come back to my, you know, stamp the risk on my head, taking a lead in terms of understanding what a risk informed regulatory framework means rather than putting blinders on and putting yourself in a pigeonhole because of somebody's interpretation of what they think might be a rule.

MR. ARCHAMBO: The problem with that is 50.59 is not risk-based.

MEMBER STETKAR: No, it's not.

MR. ARCHAMBO: It's not.

MEMBER STETKAR: No.

MEMBER BLEY: But, I see a member of the staff over here, but before they speak, if I came in and put in -- was going to put in two analogue chillers just like the ones I already had, but I did my analysis and I did C-6 and I said, gee, there's common cause failures in these, I ought to have exactly the same problem.

Now, maybe you wouldn't say, I'd have to think about common cause failures, but there's nothing in that rule that flags digital systems here.

But, go ahead.

MR. ARCHAMBO: I'll just make a comment on that, if I could.

See, on analogue systems, the failures are based on aging, component aging. So, you don't really --

MEMBER BLEY: Real failures are based on what happens and sometimes a component --

MR. ARCHAMBO: Yes, it is. But, generally speaking, you know, if I have two power supplies, the electrolytic capacitors, I know those electrolytic capacitors some day are going to fail, but the chances of them failing exactly the same time are a lot less likely, I guess, than software that may lock you out.

MEMBER STETKAR: People have installed new solinoid valves in real power plants and found out that the new solinoid valves didn't work. Those are new solinoid valves, they didn't work.

MR. ARCHAMBO: For sure and that's --

MEMBER STETKAR: That's not with aging, it's not a capacitor, it's the fact that the new solinoid valve didn't work.

MEMBER BLEY: And, this is, in fact, not a technical issue, but it's become one somehow.

MR. LUBINSKI: Thank you, John Lubinski, NRC.

So, what I want to add to, and I agree with

everything Neil said.

And, the difference when you're looking at 50.59, and this is what we're trying to answer in the risks is, there's a certain assumption right now in the current licensing basis, because, when you're looking at 50.59, you have to look at the current licensing basis, and there was a certain assumption of the likelihood of common cause failure between the two trains.

And, even if you have the analogue systems in place, there is an assumption that there's a common cause failure as part of that licensing basis.

MEMBER BLEY: And, it's not insubstantial, they just didn't know what it was when they did that.

MR. LUBINSKI: So, the question today is, when you replace both of those with digital systems, have you provided more than a minimal increase in the likelihood of that common cause failure because they're digital versus analogue.

That's where the question came. Now, I'm not -- we're trying to answer that and I'm not ready to answer it today why it's okay to do it. That's where the risk is going to go.

But, that's where the key issue came and

the question.

MEMBER STETKAR: But, John, I'm not sure that I'm hearing the same concerns. Because I'm hearing the industry saying it triggers it because it is a new, I'll call it failure mode, that has not been evaluated in the FSAR.

I hear you arguing it from a perspective of likelihood or frequency.

Those are two different concepts.

MR. LUBINSKI: Let me draw the two together, okay, and, you know, please correct me because if I'm -- I don't want to put words in your mouth.

From the standpoint today, if you're replacing on the chiller example, the two analogue controls at this point, there was already a baseline of common cause failure where you said it was low enough that you did not have to account for that common cause failure.

And, you could, in your licensing basis say, if one chiller failed, I have the other chiller in place and my safety basis is that that common cause failure was low enough that it's okay from a safety perspective.

Today, when you make the change to a

digital, have you provided more than a minimal increase in that likelihood that now says you can no longer rely on that other chiller?

MR. ARCHAMBO: Yes, that's the correct statement. It will just -- right now, the assumption is the common cause failure to probability of one.

And what we're -- as the industry is saying is that's just not doable as far as 50.59 goes.

You know, we have to get to the point, and that's where the NEI 16-16 and the new RIS and Appendix D will get us to the point where we can do a qualitative analysis so we can say the likelihood of that common cause failure happening is sufficiently low so we no longer have to consider it.

We don't have to assume both trains are going to fail at the same time simply because we put a digital device on there. That's what we're shooting for.

MR. FREGONESE: So, the one comment on the chiller example I looked at, there are some plants that have say 30-day LCOs for their chillers. And, they may have the chillers breaking within that LCO like every month.

And so, they fix it and then 29 days later, it breaks. But, it's not an MSPI system. Those hours

really aren't counted.

So, the feedback loop on failure rates for systems that are low safety significant isn't necessarily there. So, please are dealing with these failures trying to keep their equipment running.

And the -- so, even though I worked on these systems initially years ago, when they were brand new, we didn't really have these problems. Like, oh yes, they're going to last a long time. Well, guess what? Roll forward 35 years and now these things are worn out and they're failing at some other rate than what was assumed or not.

And, the reason why they're replacing them is because they're failing, not just because they want to. So, the whole idea that the new system would be less reliable than the old one just doesn't really make a whole lot of sense from a practical standpoint.

And, that's what I'm hearing from the -- at least the places I went to. They're having the same problem with the same exact type of chillers and they're using digital controls and they can't use analogue. So, that's the feedback I got on my visit.

MR. HECHT: So, I have a question. 50.59 allows you to implement changes without prior NRC approval.

MR. FREGONESE: Correct.

MEMBER SUNSERI: It sounds to me like these are important changes that would benefit the plants. It sounds like the regulator would potentially agree with you that those are important changes that would improve the plant. Why don't you just submit a license application and get the regulator to work with you so you can move forward and implement them?

MR. ARCHAMBO: I think to answer that question, and John, you can chime in as well, the impact it has on cost, the impact it has on schedule, and you know, is it really necessary to go through that?

As we talked about, the ISG-06 process, you know, it took five years to get a license amendment approved for -- yes, granted, it was an RPS upgrade versus a component upgrade, but you're still looking at significant time to get that through the process.

And, it really, in our perspective, shouldn't be needed. We should be able to do projects like these under 50.59 without coming for prior approval.

MR. CONNELLY: Just to amplify what Neil said, it's time, effort and risk, financial risk.

The framework we have to use right now is

ISG-6 and just, you've heard it discussed a couple of times today that that can be, you know, two, three, four, five years, depending on what you're -- the submittal is. And, you don't get the license amendment until you're completely done with the factor acceptance test. That attaches a lot of risk.

MEMBER SUNSERI: Are you hearing anything in any of these discussions that you think that this is going to move any faster than that would?

MR. REMER: Absolutely. The problem is, if you boil it down, is the regulatory footprint and the expectations were not clear.

There's a lot of documents that are regulatory guidance, IEEE guidance, A&S -- there's tons of guidance out there, but how you apply it and how do you use it is not clear.

I wish you had your chart, it's just kind of a -- there's a lot of guidance, but who decides to apply it when.

An inspector might decide to pick this document and make you go to that one. The Headquarters may pick this document. It's not because they're not good engineers and good people, it's just it's not been clear.

And so, the clarity will come from the

risks, from 16-16 and from Appendix D. That will give us a footprint that we feel confident that we can do 50.59 changes like this, which we can, and do submittals that require NRC approval.

We're glad to do that. You couldn't handle all the submittals if we decided to do it. But, it's a huge licensing deal to turn in a change to a license. Nobody wants to do that unless we just have to. It's just a lot of money and a lot of time, a lot of risk.

MEMBER SUNSERI: Yes, I don't disagree with what you're saying. It just seems to me that any one of your plants has a half a dozen or a dozen license amendments in the mill. Right? So, this would be another one, I get it.

But, if these are really important, it sounds like we're using all of this discussion to hold these important changes hostage. That's all I'm saying. It's on the utility, it's on the regulatory, it's everybody. I'm just pointing out a path to making the plants better and I know it's costly.

MR. ARCHAMBO: I've got one more slide and I see a lot of hungry people out there.

MR. HECHT: Can I --

MR. ARCHAMBO: Sure.

MR. HECHT: Before you leave this, about ten minutes ago, I began asking a question about exhaustive testing. And, the reason why I asked it was because exhaustive testing is how you remove the possibility of the CCF.

The CCF relates to that Criterion 6 and that is the criterion which prevents you from using 50.59 process or the main term having to do it.

MR. ARCHAMBO: Right.

MR. HECHT: Okay? I just wanted to make that clear to everybody in case they didn't get it.

MR. ARCHAMBO: Yes, and the --

MR. HECHT: But, my question is, in that 17 lines of code, you made a statement, it was kind of a broad statement and I wanted to ask you some follow up questions where you said that it was impossible to test those 17 lines of code.

And, I exhaustively test that and I don't understand that unless there's an underlying real time operating system which is also involved. Is that the case?

MR. ARCHAMBO: Yes, that's the case and also, you know, nobody can -- no one can really --

CHAIRMAN BROWN: The 17 lines are then the application code.

MR. ARCHAMBO: The execution code.

CHAIRMAN BROWN: Pasted on to the operating system --

MR. ARCHAMBO: Yes, right.

CHAIRMAN BROWN: -- that's installed. We may have --

MR. ARCHAMBO: It's an operating system.

CHAIRMAN BROWN: -- a couple hundred thousand lines of code.

MR. HECHT: And, if I'm not mistaken, there was an issue with SSPS cards that became digital. They used to be analogue and became digital.

If I'm not mistaken, they actually ran 10 to the 26th or 10 to the 23 different scenarios through that card to test it and, evidentially, that was not considered a 100 percent testing.

So, that gives you a flavor for what constitutes a 100 percent testing. There's always someone that can come back and, you know, did you hold your finger here while you were testing that. You know? There's an unlimited infinite number of scenarios that an inspector can come in and say, but did you test it this way?

Well, an SSPS card with a lot of inputs is a different situation from just one input on that DRA

and basically doing the comparitor and then giving an output.

So, I'm just wondering if part of that, particularly for the kernel and you're talking about the operating system, you don't need a file system. You don't need a TCPID stack on that particular device. You actually end up fairly simple kernel.

And, there are kernels that have been formally verified using temporal logic. So, I'm just wondering if that's a process.

And, one of the things I hadn't heard about earlier here was the use of formal methods. Is that being considered either by the industry or by the NRC in this process?

MR. ARCHAMBO: Yes, it has been considered. It has been investigated to a certain extent. Again, the problem is, is what constitutes a 100 percent testing? Who's definition of a 100 percent?

I may think it's a 100 percent, but, you know, there aren't. And, three years later when I get an inspector that comes in and says, no, you missed on.

MR. HECHT: Okay, well, there's testing for the application and then the formal methods, particularly temporal time based for that small kernel.

And so, my question was, has anybody considered the use of temporal logic combined with exhaustive testing to deal with the coverage issue?

MR. ARCHAMBO: It has been considered and, again, I would state that if that was the option, the industry would like to stay away from 100 percent testing if at all possible because of the issues we run into.

You know, if you make a science project out of it, the industry's probably likely going to stick with the motor operator potentiometer as long as they can get it because we can just replace that. We can put it in there and continue on down the road. We don't have to worry about all those kind of issues.

So, if we could take 100 percent testing off the table, we have problems with breakers with imbedded digital devices now. It's almost all you can get, they have an imbedded digital device.

Now, you'd think a breaker's a 100 percent testable, you get to a certain point and it opens up. But, there's stuff going on inside there that there's, again, there's an infinite number of questions that someone could ask about that stuff that's going on inside there and how it could mess you up.

So, the industry would like to stay away

from that because it's a hot button issue. You know, if we can have other design attributes that we can use and take that off the table, but still come to the conclusion that we're not susceptible to CCF, that's the road we want to take.

MR. HECHT: So, what I hear is that, if there were a way to deal with the operating system or the operating kernel, and you only had to deal with the application, that would be of help to you?

MR. ARCHAMBO: That would be of help and if it was acceptable, of course, to the regulator.

MR. HECHT: Right, well, that's what --

MR. ARCHAMBO: And that gets into methods of evaluation, too. That's a whole, you know --

MR. CONNELLY: Just two quick comments.

Differentiation between the application layer and the operating system, you know, there are qualified platforms out there that have been evaluated and subjected to NRC review and approval.

So, we kind of need to draw a line through these systems. You know, the application layer, you know, what are you doing to the platform to implement the design licensing basis versus the operating system itself.

The other thing as Neil had alluded to, the

SSPS cards, they are not microprocessor based. They don't meet the classic definition of digital. It's not a microprocessor executing sequential instructions, it's actually CPLD, complex programmable logic devices.

And, they were subjected 2 to the 23rd test cases in parallel with an analogue card. So, all the inputs were exercised. All the outputs were compared in 2 to the 23rd test cases. And all cases, they functioned exactly like the analogue card.

You couldn't answer the -- to use Neil's phrase, you know, were you holding your finger over here when you ran this test case? You know, we couldn't answer those kinds of questions.

So, the phrase 100 percent testability is a very high threshold to meet. In fact, I'd argue impossible, because you can always come up with another what if.

MR. ARCHAMBO: I've got one more slide to cover here if you want to --

MR. REMER: Do you want us to continue or would you like to --

CHAIRMAN BROWN: Let's hit -- you say there's one more slide?

MR. ARCHAMBO: Yes, one more slide for me

and then Mr. Connelly --

CHAIRMAN BROWN: For Neil, we'll finish Neil and then we'll break for lunch and then we'll come back for John. Is that okay?

MR. ARCHAMBO: Yes.

CHAIRMAN BROWN: All right, go ahead.

MR. ARCHAMBO: This final one is, you know, we wanted to give a flavor of, you know, if this new risk and this new NEI 16-16 and even Appendix D comes out, you know, what are the types of maybe projects that we would free up?

So, this is a representative list of projects. And, the only thing I would to say about these is, we by no means as an industry say that, in every case, all of these things could be done under 50.59. We have to follow the process.

It depends on your licensing basis of each individual plant. It depends on the individual design.

Any one of these on the list could require a LAR. Any one of these on the list could go to -- be implemented under 50.59. There's -- so I want to make that point clear.

But, these are, you know, this is a flavor of some of the things that, you know, utilities would

like to, you know, get going.

Obviously, the control room chillers and the EDG controls, you know, we'd like to get those rolling. But, you have another list there, you know, as well.

But, we just wanted to make the point, too, and drive it home is, you know, right now, in our environment is, we're more likely to stick with analogue equipment and that's really a travesty because we do believe, as an industry, that the digital equipment offers more safety, more reliable and more efficient operation.

And, just looking at the long range plan at our utility, just last week, that goes out a number of years, about 60 years, one thing that struck me is I didn't see anything that would be a digital upgrade. Because, if it's a digital upgrade, it doesn't make it to the long range plan today.

And, I participated in a plant health review committee last week and they talked about control room chillers at another plant and they listed the options. And the final option was, as a last resort, consider digital controls.

So, that's the state of the industry at this point. So, that's really -- we've got to get off

that. We've got to move off that spot.

CHAIRMAN BROWN: Okay, is that complete? You're finished now?

MR. ARCHAMBO: Yes, sir.

CHAIRMAN BROWN: With your slides?

Okay, we're going to hold off. We're going to recess for lunch for one hour. We'll come back at 1:10.

(Whereupon, the above-entitled matter went off the record at 12:06 p.m.)

CHAIRMAN BROWN: The meeting is back in order. Didn't have my microphone on. Now I'm in business.

MR. CONNELLY: We heard it, though.

CHAIRMAN BROWN: Okay.

MR. REMER: Thank you very much. So we'll continue. We've got Mr. John Connelly from Exelon. He's a senior engineering manager. He oversees all of the digital modifications and cyber security at Exelon. So John is going to run through some slides here, and he is also a key member of our digital I&C working group, overseeing several of the activities at MP1 and MP4. John?

MR. CONNELLY: Thank you. Good afternoon. I'm going to try and take this up -- a

little further up more towards the 10,000-foot elevation, try to put the context for why this is so important to us that we get this resolved.

The application of digital technology is -- it's an issue of long-term sustainability for the industry, you know, where the analog pond continue to shrink every day and we're a smaller and smaller part of it.

There are really three related issues. The regulatory framework, and I'm going to talk more in detail about that in just a moment, but the regulatory framework is one of the three key issues. You heard Bernie talk earlier about standardization of the digital design process. That's something we are trying to do through delivering a nuclear promise, ENG-008 initiative. And then organizational structures and skill sets to be able to do this better is ENG-05.

I want to talk to something that John had mentioned earlier. You know, when we look at these digital modifications, we have looked back all the way to the plant startup. We have looked at the analog systems, we have looked at the digital systems, and what we typically see is 85 to 95 percent reductions in initiating events when we digitize these systems.

We do see substantial performance improvements.

Obviously, this is highly desirable for us. We really do need to modernize our plants.

Next slide?

Okay. So kind of a State of the Union, if you will. It has been stated several times that we have done a lot of modernizations of non-safety-related systems -- turbine controls, digital feedwater systems, open phase detection. I mean, there has just been a tremendous amount of digital modifications installed at more plants in the non-safety-related site.

When it gets -- when we turn our attention to the safety-related systems, we are, for all practical purposes, stuck in the '70s. You know, it's analog RPS, analog SFAS, and this is just not something that is sustainable. We really do have to break down the barriers.

And what we're seeing across the industry is obsolescence is just becoming a more and more and more significant problem. We just can't get some of these components anymore, or we have to reverse engineer them, which is -- nobody feels good about that -- reverse engineering something you know you could do better by implementing current modern

technologies.

And a lot of this, you've heard it mentioned a couple of times today, a lot of this can be traced back to, you know, for example, 93-087. You know, this is -- that was policy that was put in place back in 1993. A lot has changed since then, but the regulatory framework has not.

So if you take these in totality -- and Neil had talked about, you know, 50.59 and our inability to get past question 6, if we have to assume a common cause failure probability of one, you know, you take all these in aggregate, we're trapped in a place that is not sustainable. And it's depriving us of performance improvements and cost saving opportunities and efficiencies that we could get. It's just -- it's right there in front of us. We could get it if the regulation would let us get there.

So, you know, we've made a lot of progress over the course of the last year through the integrated digital action plan. We've made a lot of good progress. We expect to make good progress, you know, in July with the issue of the RIS and what we're doing in MP4A.

We are making good progress, but we've got to -- we've got to make sure that we deliver the goods.

Next slide?

Oh, sure.

CHAIRMAN BROWN: Okay. Go back to that for a minute. Go back to -- the second bullet talks about equipment obsolescence. Can you relate that to analog vice the new stuff, which is digital --

MR. CONNELLY: Sure.

CHAIRMAN BROWN: -- which you're getting?

MR. CONNELLY: If you look --

CHAIRMAN BROWN: Well, let me finish the question.

MR. CONNELLY: Okay.

CHAIRMAN BROWN: When we started -- when I started doing this back in 1979, okay, converting all the NADI systems to digital, we found the obsolescence issue was as critical with the digital systems as it was with the analog systems, because the components themselves are changing. They change rapidly, and I don't just mean microprocessors. I mean the integrated circuits, the regular logic gates and circuits, you could get the introduction of FPGAs.

One FPGA that you buy or designed something with five years ago, you can't get them anymore, or you can't even get cards that replicate that particular FPGA anymore, five, ten years down the pike. And we

ended up going to a -- what we call a standard card design. We could do that because of the nature -- we had sole ownership, sole proprietorship, sole design approvalship, whatever you want to call it.

MR. CONNELLY: And the resources of the federal government.

CHAIRMAN BROWN: They were not as unlimited as you may think. The four-stars were very, very reluctant to go back and ask for more money for stuff, because Rickover had made a reputation of not asking for money each year, so they didn't -- or more each year, over and above what they were allocated.

But anyway, but the point is valid. So, I mean, aren't you faced in this circumstance where you guy a system -- I'll take your chillers, for example, that have a digital controller in them, something breaks, you are going to have to fix it. You are probably not going to replace a piece part, probably going to replace a card or a box of something.

But that box can be different than the box or the card that you had originally. So that introduces an element of difference. And if it's a software-based box or a -- whether it's FPGA combinational logic-type thing, that presents some form of concern that you now introduce another level,

or a new level of failure that you don't know about in terms of its -- once you -- in other words, you've done your CCF analysis for the first version, but now you replace a circuit card in the thing with an updated new card, which now when you look at them side by side they aren't the same anymore. They probably have fewer parts because you've got more integrated -- integrated things on there.

Have you addressed that? I mean, how -- well, you've already put in digital equipment. How have you all handled that in the past, for like the feedwater control systems, or whatever? You said you've been putting those in for 20 years-plus.

MR. ARCHAMBO: Yeah. Any time, whether it's analog or whether it's digital, you know, if you have to replace the component, you have to go through the engineering design process. So let's say you had to -- you had some digital controls on the chillers, and they failed, or they went obsolete and you had to replace it with new chiller controls, a new package, that would have to go through the same process as the old package did.

So you have to --

CHAIRMAN BROWN: Do you have to do a 50.59 --

MR. ARCHAMBO: That is correct. That is correct.

CHAIRMAN BROWN: Oh, okay.

MR. ARCHAMBO: So it goes through the same process as the original. So, you know, even though -- and you're absolutely right, and that's an industry concern because digital stuff, you know, it does have maybe a smaller life cycle. It does, you know, go out just a little bit quicker. We're aware of that.

But we have had pretty good luck -- I can say luck, you know, experiences in the past where feedwater valve controllers, for instance, in some cases they have been installed out there for 10 or 12 years and we haven't had to replace them. And you can still get that same --

CHAIRMAN BROWN: The valve or the control --

MR. ARCHAMBO: The controller.

CHAIRMAN BROWN: The controller?

MR. ARCHAMBO: The controller. And you can still get that same vintage controller today. So it's kind of a spotty issue. You know, in some cases it's not a problem; in other cases, you know, if you're dealing with servers and things like that, yeah, it's

a little bit more of a problem. But, regardless, you have to go through that engineering change process.

CHAIRMAN BROWN: Okay. Same way then.

MR. ARCHAMBO: Correct.

CHAIRMAN BROWN: Does that mean -- that may be the wrong way to phrase it, but I would presume, then, that if something failed and you didn't have an onsite replacement part, then you're down one system.

MR. ARCHAMBO: Correct.

CHAIRMAN BROWN: But so do you make an effort to try to have some type of replacements? I know what I used to do.

MR. ARCHAMBO: Well, yeah, we always have spare parts on hand. You know, it's going to be a rare case that something fails and we can't go to the warehouse to get a spare part, especially the larger fleets that, you know, maybe have, you know, a number of spare parts.

But in your example where you don't have those available, you just don't have them, you know, you're absolutely right and we'd have to do -- like we would today on anything, whether it be analog or digital, mechanical, it doesn't matter. If we don't have that part there, we will have to do an engineering change, and it's usually a pretty rapid fashion, of

course, if we need that piece of equipment in order to operate the plant.

But, regardless, it has to go through the engineering change process if we change to something different.

CHAIRMAN BROWN: All right. Answers my question.

MR. CONNELLY: Just to clarify one thing, you know, we typically wouldn't lose a system. If you're talking about digital feedwater or digital turbine controls, you know, if they are triple modular redundant, you know, losing an IO module doesn't incapacitate the system. We just go -- it automatically transitions to a two out of two logic instead of a two out of three, or however many decided.

Typically, what we do with vendors is we'll enter into long-term contracts for support and sustainability. So, you know, one of the mantras that we follow is backward compatibility. So if -- you know, if a part gets superseded, we have to maintain backward compatibility for that platform.

So, for example, an Ovation system, non-safety-related of course, but, you know, they will incrementally change over time, but one thing that Emerson is particularly good at is making sure that they

are backwardly compatible with previous revisions. So we don't really run into obsolescence issues except when you start talking about operator workstations, servers, network infrastructure. Typically, those will go obsolete much faster and they're commercial products. So that's really where we find the chill point.

CHAIRMAN BROWN: Well, backward compatible doesn't necessarily mean it looks the same. Possibly, backward compatible can be a different design, but yet the ins and outs are the same.

MR. CONNELLY: Exactly. And then you'd put it through the typical --

CHAIRMAN BROWN: It's still got to go through the design process. That's -- you answered my question.

MR. FREGONESE: On the supply side, a good segue, we -- our backward compatibility, a lot of the concerns about the physical footprints or it plugs into the same spot. So it may be a different design, and that would have to be evaluated. But for the projects we have done, say for Oconee, there's a very long-term view of spare parts availability and sourcing of typical parts that are needed over the life of the plant.

And I think the thing Neil is saying, which we found, is the failure rates are really low. And the things you replace are things -- typically, the power supplies, your monitors, KVM switch -- you know, switches, things of that nature where the commercial technology advances, the safety functional stuff, since we control the design, we don't see that much movement in it.

And usually there is a warning. Dear customer, hey, you know, part of the life-cycle planning is in 18 months we are going to cease production. Do you want to buy some parts before we do? And after that, it becomes a legacy product, and so forth. So that's how it is handled on the supply side.

CHAIRMAN BROWN: Okay. Thank you.

MR. CONNELLY: Okay. Next slide?

Okay. So, in summary, so the regulatory infrastructure for digital I&C has to be modernized. You know, we are looking at the long-term viability of all of our plants. You know, if we don't capitalize on the technology, we are going to become more and more economically challenged.

There is current and continuing, and you heard your staff talking to this this morning, or you've

heard us talk to it as well. You know, we continue to make progress, constant interactions, constant discussions back and forth with the staff to get this resolved.

The regulatory barriers to the application of control systems have to -- or digital control systems just have to be removed. We have to be able to transition into current technologies.

And, with that, I think that's my last slide.

CHAIRMAN BROWN: Is that it? Okay. Wait. There we go. Thank you.

Okay. Next on the list is NEI 96-07, Appendix D, and I guess we're back to the staff. Wendell. Yeah, Wendell Morton, staff.

(Pause.)

MR. DRAKE: Okay. Chairman, whenever you're ready.

CHAIRMAN BROWN: Are you ready? Jason, you're going to go first?

MR. DRAKE: John Lubinski --

CHAIRMAN BROWN: Oh, John is going to start off again? Okay.

MR. LUBINSKI: Is that okay?

CHAIRMAN BROWN: Yeah, that's fine.

Absolutely. We're free range chickens here, so we can do anything we want.

MR. LUBINSKI: Thanks. I want to start with, in setting up the afternoon, state that in the morning there was a question asked, and I failed to provide a complete answer. The question was, what is different today than the last time we went through the process from 2007 to 2011?

One of the key items there, if you look back at our previous efforts, there was a lot of work done on technical evaluations and technical reviews, and a lot of work done on the licensing process.

Where one of the focuses is today is as part of that licensing process we were focused on the license amendment request process, not on changes that could be done under 50.59. It has become clear to us today, the industry has said on multiple occasions during our meetings that, looking at the action plan, one of their key indicators of success is being able to do a large majority of these upgrades under 50.59, not under the license amendment request.

As they said earlier, they look at the cost of the system to be one of the -- or cost of that process to go through licensing and time. The cost and time would be prohibitive without going through the

licensing process.

I appreciate a member asked this morning of -- for the simpler applications, if they are really that critical, that important, could you go through a licensing process? And I want to clarify that we have made it clear that we are willing to accept applications. We are today.

And I just wanted to make sure there was not a misperception because I think part of the answer to that was the experiences, what we saw with Diablo, leads us to say that we're not going to be here.

Jason even said before in his presentation that the industry was also carrying some of the weight there of why Diablo took five years. I think it is a bit of an exaggeration to think that we would take five years to review a chiller application. I think the, you know, ISG-06 is definitely scalable, that if an application were to come in, we would definitely do that.

But, again, our focus right now -- and that's what you'll see this afternoon -- our nearest term items, what we're talking this afternoon, are Appendix D, as well as the RIS, which are both focused on 50.59, which is where, from the industry, we have heard that need.

So this is really looking at an efficiency on their part from a cost of doing it under 50.59 versus the licensing process. A lot of the reviews that they would do internally would be similar, and those evaluations. But that's the reason this afternoon.

You also heard a bit from the industry earlier, some -- my words now -- some horror stories of what we've gone through along the way. And I'm not going to argue, many of those along the way, but it was also stated this morning there were many contributors to that.

And I think what you also heard was the action plan, as Jason said, we have engaged with the industry to get their input to what actions are important to address these issues. And I think the last comment from John Connolly was, in addressing these issues, the venue for doing this is under these activities.

And we believe these activities are to address what those root causes were that led us into -- into areas of uncertainty in the past as well as inefficiencies. But, again, I want to focus that the reason we're looking at this under 50.59 right now is the request of the industry to allow them a process that allows more efficiency and lower cost doing things

under 50.59 versus a license amendment.

So, with that, this afternoon we have Wendell, who spoke this morning. He is going to kick us off with talking about where we are in our review of 50.59, Appendix D, and then Dave Rahn will talk about the subset of issues that we're covering under the RIS 2007-XX, which, as we stated, is a supplement to the previous.

So, Wendell?

MR. MORTON: Wendell Morton, NRC. So I'm going to elaborate more on our activity -- on our review activities with regard to draft NEI 96-07, Appendix D. We touched on it a little bit this morning.

So a few of the key messages I want to convey this afternoon is, just to clarify, because I know there is a lot of documents being bandied about, so just to clarify, NEI 16-16, and draft Appendix X, represent NEI's effort to retire NEI 01-01. That's -- I just want to make sure that's clear to everyone in the room.

With regard to those efforts, the RIS that we'll talk about a little later after this presentation is the short-term guidance that is going to help folks get some of those mods underway when these other two products are still being reviewed. I just wanted to

clarify that.

MEMBER BLEY: Okay. Wendell, just a quick question, because we received a variety of documents, including a draft on screening, and an NRC staff review of screening, and then Appendix D, draft Revision 0B. Is that the most current one right now? Just to make sure I know I'm looking at the right thing?

MR. MORTON: Right. So 0B is the version you received in March of this year.

MEMBER BLEY: Yes. And that is the most current.

MR. MORTON: That is not technically the most current version. We just received a version last night from NEI. It's based upon the last public meeting we had, the feedback we gave them, so there is a version that just got released to the staff last night.

MEMBER BLEY: You haven't looked at that yet, I assume.

MR. MORTON: We haven't looked at that yet. So for the purposes of this meeting, we'll be discussing the totality of Appendix D, because it has been through a lot of different iterations. So, but from April 2016 'til, I would say, the March 2017 version, there has been a number of changes and

improvements made to Appendix D.

So that is the latest version for which this presentation is based upon, but you should take into account the entire context, which is the entire document from soup to nuts at this point.

MEMBER BLEY: Thank you.

MR. MORTON: Also, a key message, I just want to convey that there are a number of differences between the current 50.59 licensing guidance, which is NEI 01-01, as endorsed by RIS 2002-22, and draft Appendix D. And we'll get into some more of those details later in the presentation.

And some of those changes do present a few review challenges, and we have been working diligently with NEI to resolve many of those, particularly remaining open items on that point.

And just to reemphasize what Jason spoke about earlier is we do have a very frequent engagement with NEI, especially for Appendix D, and actually for all of our working groups. At this point, we do have monthly meetings with NEI regarding -- with Appendix D. And the next one is scheduled for June 21st.

All right? So before we go any further, I wanted to give a bit of a preface and refresher for those of us in the room, in terms of 10 CFR 50.59, the

rule itself, before we get into the nuts and bolts of the guidance documents themselves as they relate to this.

So, as the slide says, the purpose is establishing conditions under which licensees may make changes to the facility without prior NRC approval.

The second bullet is very important here because I want to emphasize that though 50.59 is not the final determination on safety, there is safety clearly subsumed within the rule itself. But just to clarify, from a standpoint of the decision to come in for -- to come for license amendment or not, that's the primary reason for 50.59, not the final determination on safety. I just want to emphasize that point in terms of the rule itself.

And 50.59's main focus is about the design basis or the subset license basis as defined by 10 CFR 50.2.

Next slide?

10 CFR 50.59, screening. So the screening section technically doesn't exist within the rule itself. There is an applicability section, an evaluation section. The screening section was developed and enhanced through the base 50.59 guidance, which is NEI 96-07, which provides that enhancement in

terms of screening to determine whether you need to go into an evaluation or not based upon a specific digital upgrade you may want to get into.

The key point about the screening process is whether the particular change can have an adverse effect, and I've summarized some of the potential adverse effects of either design function or the potential -- or affecting the method or to perform a control design function.

It's those adverse changes that can either lead to a likelihood of an increase in malfunctions or potentially creating new accidents, which leads you into necessitating going into Section Charlie 2 of 50.59, which is the evaluation section, which has those eight criterion questions inside there.

Next slide?

So the evaluation section. As I said, so this is another challenging piece of 50.59, especially in terms of developing guidance. We'll get into that later.

So using it to determine whether you actually need to come in for a license amendment or not is really just -- just to boil it down, I have the excerpt there from NEI 96-07, but basically it fundamentally comes down to, if you're answering yes

to those -- one of those eight criterion questions, would it necessitate a license? That's the basic rule when it comes to the evaluation section under 10 CFR 50.59.

In terms of digital I&C licensing, and in terms of some of the concerns you have already heard today spoken from NEI, as well as staff concerns, the primary criterion of focus for Appendix D, for NEI 16-16, and for the RIS itself are going to be those four criterion questions we have down below, on the third bullet.

And this is specifically in terms of digital upgrades, i.e. common cause failure and those concerns and how you disposition those to address those particular questions.

And just for your information, I have detailed the actual quoted question directly from the rule itself, so you can -- this is just for clarification's sake. These are the four questions as they are stated within the rule itself. So that's questions 1 and 2.

Next slide?

And questions 5 and 6, I know question 6 was talked about today in terms of concern the industry had with answering that question 6.

MEMBER STETKAR: So, Wendell, I have a nuclear power plant, and I'm operating it today, and it's a two-train nuclear power plant. And can you tell me how my current licensing basis accounts for common cause failures of my two high pressure safety injection pumps?

MR. MORTON: I would say it depends.

MEMBER STETKAR: No, no. I want you to tell me how it does.

MR. MORTON: How it does.

MEMBER STETKAR: Yeah. How does it account for common cause failures of my two high pressure and safety injection pumps? Or, if you don't want to talk about pumps, the circuit breakers that supply those two high pressure safety injection pumps? Or the relays that cause the circuit breakers to close to start the two high pressure -- so tell me how my current licensing basis accounts for that now, my FSAR.

MR. MORTON: On a very basis level, if you're saying for those particular systems or FSARs, then --

MEMBER STETKAR: No. I'm trying -- you know, don't be an electrical engineer on me.

MR. MORTON: I am an electrical engineer, actually.

MEMBER STETKAR: Okay. That's -- you weren't listening earlier because I do have an electrical engineering degree. I want to -- I was told earlier today on the record that, indeed, somehow -- somehow, somewhere, the staff interprets the fact that my license accounts for those common cause failures, and that somehow now when I introduce digital things, well, it's not anything different. But I'm hearing from the industry that it is something different. So I'm trying to -- I'm trying to resolve this apparent gap.

MR. LUBINSKI: Since I made the comment, if I could expand on my comment, we have others in the audience who will help. My comment was, in the current licensing basis today -- and one of the points Wendell was going to make, everyone's licensing basis is different, but the generality in response to that is, as part of the licensing basis, when we were looking at anything that required two trains, the review by the NRC, it was determined that the probability of common cause failure was low enough that it did not need to be considered any further in going forward, and we could consider those as being two independent trains.

The change now is that when that takes place and you're going from an analog to digital, the

failure mechanisms may be different in a digital system than they are in an analog system. And the question is: is the common cause failure no more than a minimal increase in what was assumed in the current licensing basis?

And if you consider some of the reasons you may have a common cause failure between a digital -- between digital systems, it's different than you may have had in the analog systems. Norbert Corte is also here to answer or expand on that.

MR. CORTE: Yeah. So, in general, you could characterize the difference in the way that common cause failure is addressed. So there may not be a Chapter 15 accident analysis for common cause failure, but that doesn't mean it wasn't considered. One of the ways you address common cause failure is by conservative design practices and margin.

So if you anticipate an event like a tsunami, but mischaracterize that event, the magnitude of the event, margin can provide you some protection against that event. So conservative design practices and margin provide you some protection against certain kinds of common cause failures.

You also have certain regulatory requirements for diversity. So diversity protects you

against the unknown unknowns. So there are some requirements for diversity for common cause failure.

MEMBER STETKAR: So if I take a power plant that I'll call Salem that was designed and licensed with all of those good thoughts, and then when the circuit breakers didn't open, the reactor trip circuit breakers didn't, we wrote a rule that says, "Oh, my God, we've got to treat those separately because, well, there was some deficiency."

And when I had a plant -- I'll call it Susquehanna -- that had a loss of offsite power and none of their diesels started, maybe one of them started and tripped -- I can't remember the exact event -- oh, my God, we've got to address station blackout because they had one and, my God, these risk assessments say that they can happen.

So all we've done is we've patched up regulations in response to common cause failures that occurred under the current licensing basis. And I don't understand why suddenly digital stuff, because the mechanisms that might result in a common cause failure are defined to be different than other mechanisms that can cause common cause failures in existing plants, why we have to treat digital conceptually different.

MR. CORTE: Yeah. Well --

MEMBER STETKAR: That's the whole point here, because on the one hand, I'm hearing people say it's not that it's introducing new failure mechanisms, if I call it that. It's not that we didn't recognize that both high pressure injection pumps could have failed. We just believe that it was so unlikely we didn't need to worry about it, except for the cases where it actually happened.

So there's the frequency argument, but I hear people saying, no, no, it's not a frequency argument. We're introducing new conceptual failures that were never thought of before.

MR. CORTE: Well, that's true in some ways. So the last events, which I didn't mention -- let me digress for a second -- is diversity in defense-in-depth, our criteria for defense-in-depth. So that also provides you some mechanism to address common cause failures.

So what happens in the development of the common cause failure position was that with the introduction of new digital systems, they were combining a larger number of previously independent features on a smaller set of hardware and software, and so there was some question about whether that

challenged the assumptions in the FSAR, because even though there may not be a regulatory requirement for feedwater to be a different systems than steam dump, they effectively were.

So now when you combine that equipment, you have failures that occur that have a large -- could have a larger impact. So that was the context of the original development.

MEMBER STETKAR: And that I get. That is a -- that is a new and different integrated consequence, if I can characterize it that way, that was not considered, the fact that the containment spray system might somehow be linked through some common mechanism to the high pressure injection and low pressure injection systems.

MR. CORTE: Okay.

MEMBER STETKAR: So I get that. That's a distinct consequence. It's not a frequency issue at all. It's a consequence issue. So that part I understand.

MR. CORTE: So there is always this residual unknown unknowns, and that has gotten lumped in with the problem. But, in general, there were a number of motivations for the common cause position, not just the fact that there are unknown unknowns that

we're worried about.

MEMBER BLEY: Let me jump in for a second, because at times I feel like I'm in Alice in Wonderland; other times I don't. The things you two guys just talked about, that is new stuff.

Now, unfortunately, I don't know that we have a test case. This chiller thing that we heard about from the industry would make a nice test case, because there, if in fact there is a common cause -- and you're certain it is -- but there is also a common cause in existing chillers, there it would be really bizarre if that were submitted, if the logic being applied said, "Oh, in that case, you really have to do something different about common cause," because that is a parallel and, in fact --

MEMBER STETKAR: That has to be a frequentist argument.

MEMBER BLEY: That's right. So, unfortunately, though, I don't think anybody submitted one of those simple ones to go through this process. So I don't know how it would have been handled. That's enough. That's all I wanted to say on it, because the logic at that level would be very convoluted, to say some things are really different there.

MR. LUBINSKI: If I could add to that, and

adding to try and help with where Norbert was going and agreeing with his one example there, let me go back on the chiller example you just brought up. It's very clear that, again, from a licensing basis, we would have considered common cause failure between the chillers and forget the control systems. There is many things that could go wrong on one chiller that could occur in the other.

And as part of the licensing basis, while it's not spelled out in Chapter 15, there are reviews of, are we adequately protected from a common cause failure? What is the difference when you get to digital? Well, now you're talking about the introduction of code. And if you look at the failures that you would have on digital systems that are code-related, so the reliability to one system, if it's code-related, it's going to be the same failure at the same time for the same command on the other system.

So, therefore, that adds a level to a type of common cause failure you could have between the systems. Have you adequately analyzed the risk of that common -- or the probability that common cause failure is low enough? And that's why the common cause failure comes into play.

From the question 6 argument you heard this

morning on the chillers was, if you can make the statement that it is no more than a minimal increase in the likelihood associated with the current systems, then you can, in your analysis, say you did not introduce an accident of a different type because you can still -- let's stick with the logic Neil had this morning is, if one chiller fails, the other one will operate.

If you cannot make that statement and you say if the failure is it's too high a probability of failure based on the software or based on the logic in the development of the software, and entering the logic in the development of the software, and, therefore, it's higher, then you'd have to assume the second one failed at the same time, and that's when you get to a new accident.

MEMBER BLEY: When you have something --

MR. LUBINSKI: I believe these will address that, though.

MEMBER BLEY: When you have something that's very simple -- here's a place Charlie often talks. He was able in the Navy to build simple systems that sounded like -- I haven't seen the chiller one. I just heard the talk. If it's got very little code, and it's got one input that is either up or down, that's

getting pretty darn simple, and I can look at that in some detail.

Where we get into real trouble -- and where I worry about common cause -- is when we have a platform that is very complex and things can talk to each other that you don't expect. And, you know, the simpler it gets, the closer it gets to demonstrably provable that it's pretty clean. But, still, the whole unit would have a common cause failure contribution.

MEMBER STETKAR: Let me ask, suppose I came in and I was going to try to make this frequency argument I'll call it for chillers. And I know you're focusing on the fact that that digital system is now a command and control system for those chillers, which currently have some sort of analog relay driven with command and control system.

Am I, when I do my numerical comparison, allowed to use experiential data from failures of the mechanical parts of the chillers, circuit breakers, relays, everything else, and compare them to estimates of the system with and without the digital part? In other words, the fact that 99.999 percent of the common cause failure likelihood is due to things that is irrelevant to the command and control, or do I need to do a like and kind comparison for only the command and

control?

I'm asking the staff now because you're the people that I'm coming to and submitting this. I'm going to justify the fact that my digital system does not result in a measurable increase in common cause failure because the common cause failure is completely dominated by stuff that was always there.

MR. LUBINSKI: If you can make that argument, that would indeed be correct. You could do that. You don't need to do it just based on the difference between the analog control and the digital control, right? If you're looking -- if you can make that argument, that from a common cause failure that that contribution to the overall common cause failure you'd have between those two systems, therefore, it's only a minimal increase in the likelihood of a common cause failure between the two systems.

MEMBER STETKAR: Might even be a decrease, if I replace some relays.

MR. LUBINSKI: I'm sorry?

MEMBER STETKAR: It might even be decrease if I replace some relays. But I'm allowed to take that kind of holistic approach to the system, not to the minutia of the individual function that I'm staring at.

MR. MORTON: Yes. Within the scope of a

RIS, there are qualitative arguments you can make that we would find acceptable. That would be subsumed within it. It is --

MEMBER STETKAR: I'm talking about a quantitative argument now, not qualitative.

MR. MORTON: Even better.

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

MR. HECHT: Can I ask my question now about what methods you would use, and specifically with respect to qualitative, for questions 5 and 6?

MR. RAHN: I can tackle that one now. This is David Rahn. I'm in the office of NRR in Division of Engineering, so I work with John Lubinski.

The RIS that we're developing is -- it's an improvement upon our previous endorsement of NEI 01-01. And it doesn't introduce new modes of analysis or new types of analyses. What it does is it endorses -- continues to endorse the analysis methods covered in NEI 01-01.

Primarily, they were based on failure modes and effects analysis, any kind of factors that contribute to overall dependability of the system, the impact of the modes of failure on the existing design basis for the plant, and a comparison of what the old

system did versus what the new system -- how the new system modes of failure would contribute towards the impact on the design basis, but primarily using the existing methods that we have endorsed.

MR HECHT: So, then, why is it so difficult for the industry to apply those?

MR. RAHN: I think I'm going to get into that in my discussion. But I can give you the gist of it, in my opinion. In 2001, a major change was made to how 10 CFR 50.59 was worded. And the previous version of 50.59 did not entice one to get tripped up in answering questions. But the current version, specifically when it comes to digital upgrades, causes a person who implements digital upgrades or electrical engineering, I would say in particular, who has to think about details, causes one to take pause.

And they try to say, what is this question really asking, and how does it impact what I'm doing to upgrade the system that's there? So I think it's a lot a matter of breaking down the analysis methods that are endorsed in NEI 96-07, which talk about different ways you can go about answering this question based on likelihoods and what number of unlikely events would have to occur before something is possible to occur.

So I think it's to break down into an analysis of, how do you answer those questions?

MR. HECHT: Okay. And that was, in turn, based on the EPRI CCF report.

MR. RAHN: No, it was not. It's actually solely based on our endorsement of NEI 96-07 and NEI 01-01's interpretation of what 96-07 says.

MR. HECHT: But wasn't 96-07, in turn, based on that EPRI report?

MR. HUMPHRIES: No.

MR. MORTON: No. Let me jump in. So 96-07 is the generic 50.59 guidance across the board for all disciplines.

MEMBER STETKAR: Just for clarity on the record, when we refer to 96-07, you mean 96-07 in total, the whole --

MR. MORTON: As a whole, the entire document.

MEMBER STETKAR: -- not 96-07 --

MR. MORTON: Draft Appendix D.

MEMBER STETKAR: -- Appendix -- draft Appendix D.

(Simultaneous speaking.)

MR. MORTON: There is one large document, 96-07, which is the generic 50.59 guidance.

MR. HECHT: Right.

MR. MORTON: NEI 01-01 was a supplement to 96-07, specifically for digital I&C modification under 50.59.

MR. HECHT: Okay. And I was thinking about Appendix D, which you're going to be talking about later, which is based on EPRI -- on the EPRI report.

MR. MORTON: No, it is not.

MR. HECHT: No?

MR. MORTON: No.

MR. RAHN: So the EPRI report is an input to NEI 16-16, which will help us straighten out, how do I address common cause failure. And that's going to become a part of this in the long run, but not until after this RIS is fully developed and in use, and we're testing out the logic and reasoning for formulating arguments based on Appendix D.

So all of these things are being done in parallel, and in the hopes of at the very end we are going to converge all this, and that will enable us to sunset NEI 01-01.

MR. HECHT: Okay. Thank you. And my apologies for misunderstanding.

MR. MORTON: No problem.

CHAIRMAN BROWN: Okay. Well, now I need

some help.

(Laughter.)

CHAIRMAN BROWN: Blew my mind away, what mind I have left.

96-07, that was obviously put out in '96, right?

(Laughter.)

CHAIRMAN BROWN: I think I've got the format down right. Revision 1. Was there an Appendix D?

MR. MORTON: There was no Appendix D.

CHAIRMAN BROWN: What about C?

MR. MORTON: There is an Appendix C.

CHAIRMAN BROWN: There is an A, B, and C.

MR. MORTON: Yes.

CHAIRMAN BROWN: But what -- okay. I'm just trying to figure out what the original 96-07 consisted of. I thought Appendix D was brand new.

MR. MORTON: It is brand new.

CHAIRMAN BROWN: And it is there explicitly because of the issues we are dealing with right now.

MR. MORTON: Yes.

CHAIRMAN BROWN: Even though it was a 50.59 document, it wasn't, in itself --

MR. MORTON: It's not specific to digital I&C.

CHAIRMAN BROWN: Okay. It was more generic.

MR. MORTON: It was more generic.

MEMBER STETKAR: Nor does -- I mean, even Appendix D, at least, you know, naively the version that we got for this meeting, it still refers back to the main body of 96-07. It just says, well, if you're thinking about digital systems, take these things into consideration. But you still have to follow other elements of the guidance up in the main body.

MR. MORTON: So Appendix D is not designed to be a standalone for the --

MEMBER STETKAR: No, it's --

MR. MORTON: -- in general, it refers back to the main body. For the things that are specific to digital I&C, it is contained within Appendix D.

CHAIRMAN BROWN: Thank you.

MR. MORTON: So just kind of a brief history, we have actually touched on this a lot already this morning, but just as a preface I'll say -- because I know there's a lot of different documents kind of being shuffled around.

I'll just stick to -- we'll just draw the

causal chain one more time. NEI 96-07 is the generic 50.59 guidance for the agency. It is not discipline-specific. It's just generic. NEI 01-01, put out and as endorsed by RIS 2002-22, it's 50.59 guidance specific to digital I&C.

NEI 01-01 contains both licensing guidance and technical guidance. It's interspersed throughout. Based upon a number of serious different events, some of the issues which happened in industry, some of the things that our inspectors have given us feedback on, other staff members identified, it culminated in a letter being sent back in 2013 identifying those concerns from the staff's standpoint.

We have also heard, from an industry standpoint, additional concerns, confusions going on with NEI 01-01's licensing guidance and technical guidance, too. So that all culminated with NEI deciding to provide two documents to replace NEI 01-01, one being NEI 16-16 for the technical piece and the other one being draft Appendix D to NEI 96-07 for the licensing piece.

So the documents are separate, so one is just for licensing and one is just for guidance. They're tended to be used together to replace 01-01.

CHAIRMAN BROWN: So 16-16 is licensing.

MR. MORTON: 16-16 is technical.

CHAIRMAN BROWN: Okay. Which part is the licensing part then?

MR. MORTON: Appendix D.

CHAIRMAN BROWN: Okay. So what we're looking at here. Okay.

MR. MORTON: Yes.

CHAIRMAN BROWN: All right.

MR. MORTON: This presentation and this document, strictly about the licensing aspect.

CHAIRMAN BROWN: All right. Got it.

MR. MORTON: Yeah. So I know it's a little confusing. I'm just trying to make sure we're --

MEMBER STETKAR: Because, Wendell, 16-16, unless it has been changed since the one that we saw, basically has -- 16-16 has a process in it that is not limited to 50.59 analyses. It has some technical criteria that kicks you out into 50.59 space, which basically kicks you into Appendix D, right?

But it also has technical guidance, or will have, for further-on reviews to determine the significance of something that you cannot screen out, or that you need to do a license amendment for,

basically, right?

MR. RAHN: Not necessarily. You might be able to show that if you've got a minor defect, a residual defect, it could be bounded --

MEMBER STETKAR: Yeah, yeah. Okay. Okay.

MR. RAHN: -- and assisting the design basis, right.

MEMBER STETKAR: Okay.

MR. MORTON: Please go to the next slide.

This is also just sort of a summary of what I just said, so it just kind of repeating about the spiel about NEI 96-07, how all these documents are sort of related together going forward, so we can skip through that.

So Appendix D's purpose, as we stated earlier, it's providing a supplement or a specific appendix to 96-07. There was a thought that rather than have a separate, completely different document like NEI 01-01, simply add an appendix to the baseline general guidance with specificity to digital I&C.

So, just for an example, and Appendix D scope covers both safety-related components and non-safety-related components, and components with embedded technology within them. And some of the

enhanced guidance areas that you have in Appendix D covers a combination of functions.

One of the examples that Norbert gave a little earlier in terms of combining functions either within the same design function, or combining functions from different -- the different or diverse design functions, it covers guidance along there, and also provides enhanced guidance on human system interface modifications, too.

Just for more information, we have spoken to and interacted with NEI and industry on this. These are some of the areas that were felt necessary to provide better enhanced guidance as compared to what was currently in NEI 01-01. So those are kind of examples of the enhancements or improvements over NEI 01-01 that we've been told from NEI.

Next slide?

So this is the original structure of Appendix D. And I've gone through a number of different iterations, but this is the basic content. And the way the document is constructed, it has an introduction, definitions, screening, guidance, evaluation, and an overall example section.

As we talked about earlier, Appendix D is strictly about licensing guidance. It does not

provide any technical information on guidance in any format -- shape or format in the way that NEI 01-01 did.

So just to give a few key concepts, just for FYI, within the screening section and Appendix D, there is a clarification you can put in there that just because you introduce software digital technology does not in fact mean that the proposed modification automatically screens in for an evaluation as in you automatically -- you declare adversity, you automatically have to go answer those eight evaluation criterion, that there is that clarifications in there, and that's an important one.

And these clarifications do align with the base guidance document and NEI 96-07, especially the second bullet in the screening section, which is any reduction in diversity, separation, independent defense-in-depth means that this proposed modification will be adverse and would screen into the 10 CFR 50.59 evaluation section.

Conversely, in the third bullet -- now here is another difference between NEI 01-01 and Appendix D -- is the clarification that modifications to HSI don't automatically screen in. You take it on a case-by-case basis. NEI 01-01 is a bit more conservative in that regard, so there is different

criterion to be put on -- in for Appendix D.

Next slide?

So, in the evaluation section, there is a couple of -- a number of differences between NEI 01-01 for that and Appendix D, and there's different criterion thresholds we have in there. So now we bring into the -- now we bring into the mix the concepts of the CCF credible, CCF not credible, and then the different thresholds under the not credible determination within the evaluation guidance.

Just so these are some of the more challenging concepts. We're still working with NEI to sort of resolve our questions and comments and some of the open items we have related to that.

MEMBER STETKAR: Wendell?

MR. MORTON: Yes.

MEMBER STETKAR: I promised my colleague here that I would not ask what "credible" means, so I won't. It's already on the record, if you look at this morning's session.

One thing -- so I struggle with that. But something else that I struggle with -- and maybe you can help me here -- is the two sub-bullets for something that is not credible. Something is not credible, but now we evaluate whether its likelihood is either much

lower or not much lower than something called, in capitals, single random hardware failure likelihood.

So it's not credible, but I can evaluate its frequency. I'm sorry. If it's credible, it can happen. If it's not credible, I'm not sure what it means, but I can evaluate its frequency. These are for the things that are not credible.

MEMBER BLEY: If you can evaluate its frequency, it can happen.

MEMBER STETKAR: Yeah. So it would probably be credible, then, wouldn't it? But snideness aside, why do I compare whatever those things are, the common cause failure likelihood, to the likelihood of a single random hardware failure? I'm not sure why I -- you know, what am I doing? I mean, a single random hardware failure would be a normally open manual valve spuriously closing.

That's a single random hardware failure. It's not very likely. It blocks a flow path that might be common to two pumps. It might block a flow path that is -- only affects one pump. So why do I compare the likelihood of my now identified common cause failure with a single random hardware failure? What does -- I'm struggling --

MEMBER BLEY: May I just offer something?

As a read of this phrase, I would at least assume that it meant a single random hardware failure of the same failure mode for the equipment being considered under common cause.

MEMBER STETKAR: Well, and the same --

MEMBER BLEY: That's what I would assume.

MEMBER STETKAR: And the same consequence, not just failure mode. So my functional failure -- functional, is that what it's intended to be?

MR. MORTON: Well, let me preface this by saying I would open this up to NEI if they want to provide more clarification on these points, because some of these concepts that we're putting forth are still under review and still --

MEMBER STETKAR: Okay.

MR. MORTON: -- determine some of the finer points.

MEMBER STETKAR: Are you having discussion on those types of -- okay.

MR. MORTON: Yes.

MEMBER STETKAR: Then I don't -- because I know it's in a state of flux. As I read through this stuff, if I get past the credible stuff, I just couldn't -- because it is always just presented like

this. Okay.

MR. MORTON: Yeah.

MR. RAHN: I'd just like to augment. There is a need to make this distinction, and it's not -- there's actually a method to the madness. So what happens is, when you do a 50.59 analysis, you're comparing what you're doing to the plant, what change you're making to the plant, against its design basis.

And most of the plant is designed for single failure -- ability to sustain a single failure. So what that means is that accidents and malfunctions that are assumed in the analyses that could occur are all part of its design basis analysis.

What happens is, if you can show that something is much lower, way, way lower than the single failure design basis analysis would -- likelihood was assumed, you might be able to use a different method of analysis. Instead of using design basis methods, you might be able to use best estimate methods.

MEMBER STETKAR: But, David, in -- all of the licensing analyses I have seen says thou shalt assume that you have a single failure guarantee.

MR. RAHN: Yes.

MEMBER STETKAR: So its likelihood of failure is not part of that licensing. It is there,

and everything else cannot fail. So it has a failure likelihood of precisely zero. So I have one thing that must fail, and everything else cannot fail. So I'm not sure what I'm now comparing it against.

MR. RAHN: So, in your analysis method, you are assuming it cannot fail.

MEMBER STETKAR: Yeah.

MR. RAHN: Right. So it actually has a very low likelihood of failing.

MEMBER STETKAR: It might have a high likelihood of failure.

MR. RAHN: No, no. I'm saying the --

MEMBER STETKAR: In the real world, if you do a risk assessment, it might have a relatively high likelihood of failure.

MR. RAHN: But for the ones assumed in your single failure analysis, might have -- it has a failure number to it.

MEMBER STETKAR: Whatever it is.

MR. RAHN: Right. Whatever it is, right. So, but if you're putting in something that's considerably more dependable and more reliable, but still has a possibility of failing --

MEMBER STETKAR: As does everything in the world.

MR. RAHN: -- as does everything in the world, you might not have to use design basis methods for your analysis to see what are the consequences of that failure. You might be able to use best estimate methods for doing that. So that's why they have this distinction.

MR. MORTON: So just to put some more context on it as well -- and I should have said this earlier before I started the discussion -- so Appendix D and NEI 16-16 are tied together in terms of their inputs to each other. So this framework and the phraseology is tied to NEI 16-16. So when you look at this, you have to look at it for --

MEMBER STETKAR: I had the same question on 16-16, but I had no examples over there or anything, so --

MR. MORTON: Also, just another thing, when I had the bullet earlier about the differences between 01-01 and Appendix D, so on 01-01 you essentially had one sort of threshold of credibility. It's sufficiently low. They didn't go into a lot of the nuances that you see right here in Appendix D. So those are some of the things we're still looking --

MEMBER STETKAR: And these nuances have clarified it to everyone.

MR. RAHN: Well, we're in the process of clarifying it in our own heads, so that --

MEMBER STETKAR: Okay.

MR. RAHN: -- but we're not quite there yet.

MR. FREGONESE: This is Vic Fregonese. Just to make a comment, I'm not going to talk about this definition because we've had a lot of discussion just as lively as the one we're having today with the staff.

But one of the things that has caused this to be discussed is what's in the SRM. And it says something like inasmuch as a software common cause failure is beyond design basis, then best estimate methods can be used. That's actually in the SRM.

So there's a lot of question about what that means. And one interpretation of what that means is that a common cause failure of things that are safety-related, that are not supposed to fail, is so kind of remote that it really could be considered beyond design basis.

So, for instance, things like the ATWS rule and SBO were treated in -- as you pointed out, and maybe NEI 12-06, which talks about FLEX and Fukushima, there's a lot of beyond design basis language.

So, now in 50.59 space, that also causes

additional problems because the 50.59 experts scratch their head and say, "Well, what does beyond design basis mean for 50.59?"

So we've gotten into a lot of this dialogue. It's not resolved yet. But the credibility part has to do with, when the original systems were designed, there might have been some implicit assumptions that might not be documented in your FSAR.

In a lot of those, since almost all of it was hardware, like cards and stuff, we actually looked in some cases as designers into what would happen if a power supply failed, or something like that. And that was kind of I guess the dominant -- and I'm going to talk in risk-based -- kind of the failure, that was the most limiting, and we've considered that. And now the question is: where are you today in failure space?

The sense that we have on the industry side is that the digital systems are way more reliable, and the reason why we're putting them in is because the hardware stuff is starting to fail on us, and we're not really sure what to do about it other than fix it.

So that's why these definitions are still in active discussion. So thanks for the opportunity.

MR. MORTON: Thank you, Vic.

MEMBER STETKAR: Hopefully, the next time

we see a new revision, they will be clarified a little bit.

MR. RAHN: That's the goal. Yes.

MR. MORTON: So the next slide, so just some of the -- just so -- just to close out this particular slide, so the other terms, the terms of attributable and discernible, negligible, these are all things that have been gleaned from the base document, NEI 96-07, and they have been brought into Appendix D for additional clarification how to perform the evaluation work. So these things are still under you as well.

So the review challenges, we've talked about these a little bit previously, but these are some of the areas we're still working -- working with NEI to resolve, some of the open items we still have when it comes to these areas. And the most important ones would be these four, and they kind of cover both the evaluation section and the screening section.

We just talked about the third bullet, which is a clarification on the CCF outcomes discussion, which was essentially the last slide. And that's the last side in that particular portion of the evaluation section, because we essentially just started to review the evaluation section this past

month. So that's sort of an ongoing process.

The other two sections, such as HSI guidance differences, between that and NEI 01-01, and some other acknowledgements and considerations, other design-specific things for digital I&C, we're concerned about getting -- making sure that's acknowledged to some degree.

Another important one that kind of dovetails with NEI 16-16 is the mapping between the two documents themselves. So I touched on it a little bit earlier in terms of some of the terminology in the evaluation and analysis that's recited within Appendix D is essentially mirrored within NEI 16-16.

So NEI 16-16 provides the technical input to answer 50.59 pieces, whether it's the screening or the evaluation questions.

One of the key pieces to that is determining what pieces of NEI 16-16 can be used to answer screening pieces, versus which pieces of NEI 16-16 can be used to actually resolve evaluation questions, and which sections evaluation questions are specifically targeted to.

So those are sort of the things, when we talk about understanding the interface between those two documents, that are of concern. And, like I said,

we always want to reiterate that we are always working closely with NEI to resolve these concerns we have on this.

And so when we talk about the interface between the two documents, this is pretty important because if we're going to retire NEI 01-01, it's pretty important to understand and realize how the two documents that are going to replace NEI 01-01 actually match up and meet up conceptually, so that there is synchronicity between them.

So consistency of terminology, so we talked about things like CCF credible, CCF not credible, what does that mean between the two documents, are they consistent, do we have a consistent understanding between those concepts between staff and industry. That's all still a work in progress.

There is also an interesting term called negligible. We're not sure how to get that translated from NEI 16-16, so that's kind of an idea when we say "consistency of terminology."

And like I just spoke about earlier, in terms of mapping, so which portions of the 50.59 licensing process can be gleaned from different pieces of NEI 16-16.

And as they referred to earlier, and as Vic

referred to earlier, the potential inappropriate use of best estimate methodology to address 50.59 criterion, as we said earlier, 50.59 is about design basis analysis within the licensing basis. Best estimate methodology is not design basis methodology.

So ensuring that the pieces of NEI 16-16 that are appropriate for 50.59 are the ones that use 50.59 is part of that -- part of the concern when it comes to the interface between them.

Next slide?

And this is sort of where we think it's going to go in terms of the structure for NEI 16-16, although I believe it has probably changed since I put this slide together. This is just sort of an idea of where the inputs can feed into the different portions of Appendix D.

And, lastly, we have our schedule for MP2. We have actually closed out a number of items.

Our next public meeting -- I apologize it's not on this particular schedule, but our next public meeting is scheduled for June 21st of this year.

And that concludes my presentation. Does anyone have any other questions?

MR. HECHT: How do you intend to resolve the mapping? You kind of have it in chart 16, but you

point out to the -- you point to the fact that there is an inconsistency, and I gather that's because 16-16 addresses more than 50.59 issues, because it addresses --

MR. RAHN: Yes. Basically, you have to understand how these documents are even being created. We have project teams, and they are -- even though we talk to one another, there is a team very much focused on addressing the CCF, which is part of NEI 16-16. There's another team that is very much focused on Appendix D.

There is a few members that are common to both, but it's not -- you know, Wendell is one of them. But what happens is the terminology that appears in Appendix D is language primarily based on 10 CFR 50.59, the statements of consideration for 10 CFR 50.59, and NEI 96-07 Revision 1.

And the language associated with, how do I address CCF is -- is language based on today's technology for dealing with and avoiding the potential for having common cause failure. It's a highly technical discussion. It doesn't have a mapping to 50.59.

So what we had to do is try to come up with a language that allows us to, when we start talking

about dealing with CCF, we want to have a language that has a corresponding placeholder in Appendix D, that we know what we're saying when we're saying it's negligible or low, low likelihood, or sufficiently low.

We don't have that term anymore, but we have a bunch of terms that have been in the vernacular for many years. And now we have to be very precise in how to address CCF. And once NEI 16-16 is completed, as you surmise, it is going to cover how to deal with CCF no matter whether you're doing a license amendment request or you're doing a 50.59.

MR. HECHT: I was asking -- you answered a conceptual question about the approach and the problem. I was asking a more specific question, and perhaps I could rephrase it. Will there be a table, and will there be a glossary, so that the ambiguity between the tracing is removed? Between 96-07 Appendix D, to use the right terms, and NEI 16-16.

MR. MORTON: So from a nuts and bolts standpoint, we've already had joint meetings involving both of these concepts, where we actually -- the staff internally is reviewing both of these documents. We are individually looking at both Appendix D and 16-16 to see if there is alignment between them conceptually and in the nuts and bolts terminology.

We actually have open items from MP2's working group on this topic. So everything that we put in the presentation, NEI has been informed of in terms of the need for consistency, and then demonstrate that in either one of the documents. It doesn't have to be both, but one of them needs to be -- have the consistency and point to the appropriate section.

So between -- interactions and public meetings is how we're having this conversation with NEI on this topic. We have informed them about it. We have open items tracking the consistency concern, as well as our own internal reviews of the documents to ensure that they are aligned.

But there is inconsistency now because Appendix D is a bit -- is a little farther ahead than 16-16, simply because it was submitted first, we're farther ahead in the review. So that's why there -- that's why there is probably more than you may think there is because there's just -- they're at a different point in their reviews at this point.

MR. LUBINSKI: If I can -- John Lubinski. The shorter answer, yes. Whether it's a roadmap or not is a question, but we will not approve Appendix D and 16-16 unless we are clear that any ambiguity between the two is cleared up. So there will be the same

definitions, and we would not approve it until we have that clear satisfaction.

MEMBER STETKAR: Can I ask a question about -- and just tell me if it's still in flux. I'm happy to actually hear that. One of the staff's comments, on at least draft 1 of 16-16, seems to take issue about things like, what is the definition of a common cause failure? And in that comment, I read -- it says, "The NRC staff uses the term to identify an error in software regardless of the consequences of that error. NEI uses the term to identify an error in software that has been triggered to effect multiple instances of the software. And then it focuses attention on the plant effect rather than on the software error itself."

So is this a fundamental difference in the way that people think about what a common cause failure is, so that the staff says, "I don't care what happens as a consequence of the common cause failure; it's just something that happens"?

That's an important concept, and that's why -- that's the only reason I brought it up, because we're talking about consistency in definitions and understanding of things.

MR. MORTON: Well, you asked the

question -- it's still in flux.

MEMBER STETKAR: That's all I wanted to hear. Thank you.

MR. MORTON: You're welcome.

MR. RAHN: Where it becomes critical is that we have a bunch of outstanding SRPs, VTPs, a lot of NRC guidance documents that uses the term. And we typically associate it with a potential for having a CCF, and NEI's is more applicable to the type of CCF or the effect of the CCF.

So one is the potential for having one, which is mostly -- most of NRC documents are talking about that, and NEI's focuses more on the effects of having it.

MR. FREGONESE: Can I make a comment, David?

MR. RAHN: Yes. Go ahead, Vic.

MR. FREGONESE: This is Vic Fregonese again. So not to continue on this discussion, which is almost closed, but there was a little bit of a difference in what the CCF is caused by. And I think if we go back to the SRM, there's a lot of discussion about software.

And our 16-16 guidance that we've developed talks about things other than software,

because there's a lot of stuff that goes into these digital systems, and so it's not just a software common cause failure.

A lot of the defensive measures don't have anything to do with preventing design errors. It has to do with preventing things like we talked about to deal with the failure of a power supply, for instance, or maybe a common communications network, or things like that.

So it's not just limited to software, and I think somewhere along the way, at the end of all of this, this will have to be defined so that the common person can understand what the heck it means. So that's the end of my comment.

MEMBER STETKAR: And I don't, again, want to get mired into whether it's software or hardware or vaporware, or any kind of ware. It's I want to make sure that we're talking about something that's tangible. I can conceive of simultaneous spontaneous human combustion causing all of us to burst into flames.

I don't think it's very likely -- I hope it's not -- but I can conceive of that as something that I might need to somehow worry about and address. It's a low likelihood event, and many people might believe that if it does occur it would be a net benefit to

society --

(Laughter.)

MEMBER STETKAR: -- this room. So that we talk about things that are both tangible, common cause failures that -- that I can identify from an engineering perspective, and that have a consequence that I care about, because some common cause failures may have completely irrelevant consequences, certainly in terms of plant safety.

And that's kind of where I was headed and, you know, I don't think you can divorce the concept of a potential common cause failure as something that we need to spend a lot of resources about. I think we need to spend resources on evaluating kind of tangible common cause failures from an engineering perspective.

So I'm hoping that, you know, regardless of what the concepts might be out in the regulatory body today, that we eventually get to some sort of agreement, because I'm still hearing different --

MR. MORTON: There is an effort within Appendix D, the evaluation section, to take that into account specifically.

MEMBER STETKAR: Okay. Thanks.

MR. RAHN: Okay. So let's go to the next slide here.

So what I'd like to do is talk about the project we currently have to develop a RIS, which will help us clarify any endorsement that we had of NEI 01-01.

Next slide, please?

So today basically I'm going to talk about, why are we doing this? Why are we having this RIS? I'm going to talk a little bit about the background for it, which a lot of good stems from that -- a near-term need expressed to us by industry, but it also is based on -- yes, Chairman Brown?

CHAIRMAN BROWN: No. It's a matter of, if everybody is comfortable, we can proceed. We were due for a break in about 15 minutes. We can take it now and come back, or we can -- I don't know how long David is going to be, so --

MEMBER MARCH-LEUBA: My preference is to keep going. If anybody needs to get out for a moment, because I --

MR. RAHN: I don't even mind taking a break in the middle. It's okay.

CHAIRMAN BROWN: Okay. That's fine with me. Then let's go ahead.

MR. RAHN: Okay.

CHAIRMAN BROWN: Thank you. Dennis

already took advantage of that opportunity.

(Laughter.)

MEMBER BLEY: I didn't wait for you.

CHAIRMAN BROWN: Well, we were going to announce it, but we decided not to.

MEMBER BLEY: I don't care.

(Laughter.)

CHAIRMAN BROWN: All right. Go ahead.

MR. RAHN: So I'm going to talk a little bit about the inspection findings that we've had over the years leading up to the development of this RIS, and then I'll talk about our strategy for coming up with this document in a very short amount of time, talk about what scope that we've carved out of the universe of things that could be changed under 50.59, to which we are going to apply the criteria in this RIS.

We are also talking a little bit about what portions of our old endorsement are impacted by this RIS. We're also going to talk a little bit about what arguments could you formulate to help address the 50.59 questions, primarily questions 1, 2, 5, and 6.

Also, what kinds of attributes and quality measures can you refer to in order to reduce uncertainty in performing modifications that have the potential for causing impact on the plant design basis.

Finally, we are going to talk a little bit about a methodology that we're proposing to develop a qualitative assessment document that can be used by the person who is performing the 50.59 as well as someone who might be inspecting it maybe two or three years later, and then try to come up with some consistency in that.

And I'll discuss a little bit of our schedule that we've been working on.

So, first, I'll talk a little bit about the need. So just as by way of a little bit of a background, NEI 01-01 document, as Wendell told us, it has both technical requirements in it, and it also has a method for addressing the revised 50.59 evaluation criteria.

NEI 01-01 has been out there for a long time. It's the current go-to guidance document for developing digital modifications for nuclear power plants. So it's like people across the industry are familiar with it.

So, you know, this is a -- it's a document that when it was revised in order to address the criteria, 50.59, when it was revised, and so our problems that we've had with it primarily have to do with, how do you make the interpretations needed to answer those criteria, and then how do you document your

technical basis for answering those questions. So we're narrowing in on that aspect of it.

So, but we heard from industry that we have an immediate need to provide some kind of clarified guidance that would enable us to get off the table a lot of the low risk significance or low safety significant and easier-to-analyze modifications. And we see no reason why we couldn't do that.

So what we're planning on doing is issuing this document this summer. We're not planning to wait for a resolution of all the issues that we talked about from Appendix D and NEI 16-16. However, the problem we're facing is that we don't want to be incompatible with NEI 16-16 when it comes out, and we don't want to be incompatible with Appendix D when it comes out.

So it's -- if you say too much, it's not good. And if you say too little, it's not good, and it won't be useful. So what we're trying to do is come up with, you know, a just right, you know, of the language that would enable us to understand completely, how do I evaluate a proposed digital modification and still address each of the 50.59 criteria exactly right. And that's the trick, so we're trying to work on that.

Next slide?

So let me talk a little bit about some of

the issues that have been out there that helped us to derive the focus for this. And I think maybe you were asked about this earlier. What are some examples of issues that we have come across?

People that have used NEI 01-01 in the past have performed 50.59s, and our inspection staff would go out and do component design basis inspections. And many times they will ask to see -- "Let me see a bunch of 50.59s you guys did over the past year." So they'll start leafing through them, and we have a staff of people that are experts in I&C, so they'll pick the ones that are associated with their expertise.

What has happened is there are some instances where it appears that the person who developed the responses to the 50.59 either didn't have a full appreciation for what aspect of the design could impact the safety analysis design basis or they did not adequately document, you know, their use of appropriate standards, you know, codes and standards or quality measures that they might have applied.

So, and that is actually, we think, maybe the primary fault of NEI 01-01, if you have -- if you say there is one. I actually am a fan of NEI 01-01. I have used it in the past, but primarily that was before the design change, the 50.59 wording change.

So the issue that we're trying to resolve is that, how can we improve what does NEI 01-01 say about how to adequately document their technical basis for answering those 50.59 questions. And they're trying to do it in a way that both credits design attributes and quality measures, and operating history, operating experience, towards an argument that either -- that there is a lower likelihood of occurrence or if it's lower than what was there or -- you know, basically, you're comparing it to the assumptions of malfunctions that have already been part of the design basis. You're comparing the likelihood to the existing design basis likelihood.

So someone asked about -- the example was LaSalle County Station, near and dear to my heart. I was the lead I&C engineer for that plant. The issue there was that the licensee decided to replace a reactor manual control system, which is a very complex system. It allows operators to select a control rod and move it a notch or the number of notches that is indicated by the nuclear engineer for the plant on startup and shutdown, making power level changes.

It was a very antiquated system and fraught with all kinds of cards that could fail. And the licensee determined that, hey, there's a modern digital

system that General Electric provides for our BWR-6s, and ABWRs, that allow you to do -- it happens to allow four rods simultaneously. So you have a geometric insertion of reactivity in the core.

However, the LaSalle County Station wasn't licensed to move four rods. It was only licensed to move one rod at a time. So, but the system did everything else that they wanted. It had all of the other functions. It just had this one extra feature that they didn't need.

So they contracted with GE to prepare a software modification to that system, and they designed that feature out. So now the review came up of that particular 50.59, and the question came up as well, you know, how do you know that it won't accidentally kick in? And so the licensee, at that point said, "Well, there's a whole bunch of things that would have to happen for that to kick in." Number one, the software would have to fail. That's the one thing.

However, there was a high quality design process prepared for that particular modification, and General Electric had just recently updated their quality standards for that. So it was a good system.

Secondly, someone would have had to program in four control rods that have to be moved, and

they'd have to have it approved by the nuclear plant engineer.

Third, it would have to be -- you know, you have to begin the process of moving a rod.

And, fourth, there is an enable function that you have to first enable it before you can hit "go." So all those things would have had to perfectly line up before you could ever move four rods.

So the inspectors, that was one argument that was used to say that it was unlikely. It was not clear to everyone -- it might have been clear to the licensee's interpretation, but it wasn't clear to the inspector's interpretation, that that kind of argument could be used.

So that's one type of a mod. Another one, the SSPS card, we talked about earlier. So in a Westinghouse plant, there's a process protection system that feeds into a -- this called Solid State Protection System, receives inputs from processes that -- and it makes -- and it has already made the determination that a process might have exceeded a certain threshold, and that it creates the logic that either causes a scram or -- or enables an ESF actuation of some type. It's a very critical system.

The system that was originally there was

a -- it was a Motorola high threshold logic system. Actually, it was pretty cool because it's -- you know, it's 15-volt logic, not five-volt logic. So it took quite a bit of noise in the environment and still kept on ticking.

Unfortunately, Motorola decided to get out of that business, and most -- you know, lots of licensees found themselves without card replacements. So the PWR Owners Group contracted with Westinghouse to design a replacement board. Replacement board used a CPLD, and so I think the licensees at that point, or the PWR Owners Group, looked at a CPLD as something that, oh, it's all solid state, there are no moving parts. You know, there is no -- there is no running program in it, so to speak.

And I guess our inspectors thought that, well, somebody had to program this chip, you know, so we have to create the HDL language that puts all the gates together in the right order.

What kind of software modification, what kind of process was used? And apparently the licensee was not able to answer those questions.

Another instance was the -- I guess in this case the plant originally just did a 50.59 screening. They didn't actually do the full evaluation.

So that's like a misunderstanding on the part of the licensees as to what is implied in NEI 01-01 when you have the potential for impacting the safety actions of the plant by introducing a new type of failure.

So, in this case, Westinghouse actually had done a very good job on designing that card, but it wasn't really well documented. So the card, as we talked about before, it has basically multiple inputs to it. Some of the things they could do with it is demonstrate through 100 percent testing, quote/unquote. Well, they did 223 tests, but 223 wasn't 100 percent. You know, there was probably like 60 percent or something.

So, however, they then performed an analysis to demonstrate that those other combinations are just not possible to occur. You know, it's just like, okay, we didn't test them all, but they could never even get to that stage where we trigger those things.

So, and the other thing we did is we evaluated the method by which they did their software quality. That was an area where, okay, it wasn't -- they didn't have a very detailed software quality program. However, we traced their software

quality back to their -- you know, the requirements in IEEE and the GDCs, basically, for quality processes, Appendix B and the GDCs.

And we were able to demonstrate that the steps that they perform, including validation and verification, are the steps that are needed to do a high quality software development process.

So although they had a good story, they just didn't write it down, and the inspectors that were there had nothing to go by. They couldn't say you did an adequate job, because there was nothing for them to look at. So that's a case where either the licensees didn't understand what they were going to do with this card when they got it, or, you know, in terms of documenting the change to the plant, or, you know, they thought it was covered in some other way.

But, anyway, so it's out there now, and we did a topical report on it, and we found it to be a pretty good design.

Other issues we have is on these chillers. There was a chiller mod done at a southern plant, I think it was, and the case was this is a plant that has three chillers. And they had already modified one of the chillers with this digital upgrade, but they hadn't got around to the other two. And there is a case where the

inspector determined that, well, had they -- had they done all three, they didn't have enough adequacy in their documentation to say that they have covered the idea of having a common cause failure.

So, you know, that -- I think that thinking, you know, is all, you know, because of confusion in the adequacy of documentation because NEI 01-01 wasn't that detailed about it. So what we're trying to do now is come up with a means by which we could modify or clarify our previous endorsement to add the parts that we think could have been enhanced in NEI 01-01.

So, but by far and away, the bulk of inspections have all been based upon inadequate documentation of the technical basis supporting the reasoning for why you could answer no to each of those 50.59 criteria.

MR. MORTON: Wendell Morton. So just to touch off what David was saying, so there is a specific criterion requirement for documentation within the rule itself. And 01-01 and NEI 96-07 have wording in there about documentation, but it's not as tight as it needs to be from our estimation, especially based upon our observation of what's going on in the field right now.

So there is documentation in terms of the design basis or technical information that the licensee used to justify the results of the 50.59 evaluation, that's some things we put into the RIS itself to tighten that up.

And then there is a structure we put onto the qualitative assessment piece of the RIS because NEI 01-01 does not actually have --

MEMBER BLEY: Don't touch the mic, please.

MR. MORTON: Sorry. Yeah. So NEI 01-01 doesn't actually provide any guidance in terms of the actual structure and documentation requirements of the qualitative assessment itself. So part of the RIS is going to establish those things and clarify them from what's in 01-01 right now.

MEMBER BLEY: I have a question for you. Supposing you folks and the industry folks get together and you figure out this, at least for certain classes of equipment, how to define this stuff pretty well. But there is still some thinking about it and talking about it.

Do you have to rely on getting the words so perfect that it will never be misinterpreted by inspectors out in the field? Or are you going to have some kind of interaction with the inspectors to get

everybody on the same page on this thing? Because I don't think you can make the text so clear that it always works.

MR. MORTON: To your point, so part of this evolution for this work activity is we get involved -- regional support from the inspectors themselves out in the field. They have been actively involved in the development of the RIS itself, especially in terms of the documentation and clarification of equipment.

So we are actually getting and working with our inspectors directly, keeping them informed of what we're trying to do, the scope and activity, and what specifically are you seeing in the field that is giving you concerns about documentation, or any other aspect when you're doing your 50.59 inspections. So we're taking that and it's being directly fed into the RIS development --

MEMBER BLEY: Are you sending notes back and forth, or are these guys sitting down with you and --

MR. MORTON: We have weekly teleconferences.

MR. RAHN: But I think over and above that, we're planning on a workshop after the dust settles to go through this RIS.

MEMBER BLEY: Do they come up and participate in the public meetings?

MR. RAHN: I sure hope they will. I don't know if they --

(Simultaneous speaking.)

MR. RAHN: But they're on the phone. They dial in.

MEMBER BLEY: Okay. So far, they haven't been coming up. You've had a couple of meetings.

MR. RAHN: Right. But we've had them on the phone.

(Simultaneous speaking.)

MR. MORTON: If they can't show up for the public meetings, at least we're still in touch with them.

MR. REMER: Jason Remer from NEI. Just to confirm that, we intend to do -- when the RIS comes out and gets approved, to do training, interim training across maybe the regions. And then once 16-16 and Appendix D -- we will have another series of workshops with the NRC, participating together, to get this message out because we have to -- we've got hundreds of engineers that have to figure this out, too. So we realize training and education is going to be a big piece of this.

MR. RAHN: Next slide?

So our strategy for putting this together is we're first focusing on the four key questions that give us the most trouble, which is criterion 1, 2, 5, and 6.

The other thing is we -- we did this kind of like at a -- you know, we have few other assignments right now. We are really focusing on getting this done. So, yeah, we do have other things to do, but we do them at other times.

So as somebody once said, you -- there's 24 hours in every day, but then you have all night. So --

MEMBER BLEY: So I don't remember -- several of you have mentioned this. The rule change on 50.59, when did that happen?

MR. RAHN: Well, actually, '99 it started, the wording changes were bandied about. But by 2001, it was October 4, 2001, I think it was.

MEMBER BLEY: Okay. But I&C folks were involved in that discussion.

MR. RAHN: No, that was not -- no, not at all. And that's -- you know, that was a focus of the licensing -- you know, the licensing folks, not I&C folks. It was 50.59, regardless of what changes are

made.

MEMBER BLEY: Yeah, I know, but they could have -- it might have helped if you --

MR. RAHN: Yeah. It sure would have.

Okay. The other thing is that we thought, okay, as a first shot at applying this criteria, we would try to focus this thing down to the types of low safety significant and relatively easier to analyze type modifications.

So we have a specification in the body of the RIS that talks about what that scope is. I'll be talking about it in I guess the next slide.

So there was a version of the scope that you probably saw in the March 30th version of the RIS. We have actually sharpened our pencils a little further, and we have narrowed it to these bullets here. But primarily the issue is we are trying to avoid problems in answering 50.59 questions.

So the first is that the change would not compromise any design basis independence or diversity. The second is that the change would not introduce potential for the types of failures that would have to be a new failure that's considered within design basis. That obviously requires a change to the design basis.

And the other thing is we're avoiding the

kinds of modifications that -- where you have shared resources, such as power supplies or HMI stations, so that we're preventing the possibility of having cascading failures from one of those shared resources to multiple systems.

We are also including things that could have -- shown to have a likelihood that -- of a defect that would be considered significantly lower than single failures already considered in the design basis. So, again, that's similar to the first one where we don't want to -- we don't want to have to monkey with the design basis.

The other is that the effects of any postulated triggering associated with a proposed design change could be shown to be capable of either being tolerated by the design or being bounded within the existing design basis analysis.

So we're thinking that kind of cuts down things that have multiple combined systems, for example, which then, as soon as you do that, you run the risk of saying, could there be something common that could cause two, let's say, even non-safety systems that were not -- that were always considered independent of one another now to have some potential impact that wasn't analyzed.

MEMBER STETKAR: So since we seem to like chillers today --

MR. RAHN: Yes.

MEMBER STETKAR: -- this is --

MR. RAHN: Chillers would fit in here.

MEMBER STETKAR: -- as I -- well, but not if I propose a common control system for my two chillers.

MR. RAHN: Oh, yeah. I agree.

MEMBER STETKAR: Because that -- I would not --

MR. RAHN: It would release your --

MEMBER STETKAR: Well, I thought you'd point to the second bullet because they're not independent now. They can still have common cause failures and --

MR. RAHN: Actually, all of those --

MEMBER STETKAR: -- those common cause failures were considered in my licensing basis for those chillers. I've been told that already today.

On the other hand, it introduces now an explicit commonality between those two. So, but you agree that I cannot, according to this at least, install a common control system, a single control system for both chillers and says, you know, you start now, I want

both of you running. You shut off now for --

MR. RAHN: I agree with that -- that that's not part of the scope of this RIS.

MEMBER STETKAR: Okay.

MR. RAHN: Not to say someone couldn't try to do it and it -- I mean, they could do it with the normal NEI 01-01, and then I think they would fail there. It would probably have to require some analysis.

But, basically, if the chillers are credited independently in the FSAR, that has to -- that independence has to stay that way.

MR. LUBINSKI: John Lubinski. If I could add to that, a very important point, under the scope of this RIS, as we said this morning, this is a supplement to a subset. We're not withdrawing the other guidance. And if I could just add -- I'm sorry -- is that NEI said this morning that they're not doing these kind of upgrades using 01-01 right now.

We're looking at this being the trigger to allow some upgrades of what's within the scope of this RIS only.

MEMBER STETKAR: Some upgrades, but a pretty narrowly defined set of potential upgrades.

MR. LUBINSKI: Yes.

MR. RAHN: Next slide, please?

Yes?

MR. HECHT: I have to ask the question again that I asked before. How would you -- by what analyses, what methods -- I'm not even going to say analyses -- by what methods would you show these conditions? And, in particular, well, all of the conditions, how would you show this? Is this the FMEA or --

MR. RAHN: Yes. Yes.

MR. HECHT: But the FMEA won't deal with, for example, the likelihood questions, which are the last two bullets.

MR. RAHN: No. We're going to get into it. We have a different method I will be discussing in a few minutes about the likelihood aspects of it. I thought you meant from a technical aspect.

MR. HECHT: Well, that is a --

MR. RAHN: It's technical. All right. Yeah, that's true.

(Laughter.)

MEMBER STETKAR: We don't design plants on -- here comes the meteorite. We don't design plants against meteorite strikes, despite the fact that an FMEA would conclude that it's a bad day if you're hit

by a meteorite. We do consider frequency and consequences, whether we do it explicitly, like you do in a risk assessment, or we just wish things away like has been done traditionally in design basis licensing analyses.

MR. HECHT: Okay. So you'll get to it.

MR. RAHN: Yeah. We're going to be covering this in a few minutes.

So the parts of NEI 01-01 that are causing a little bit of consternation, NEI 01-01 is a very good document when it comes to technical things that you could do to have a highly dependable control system.

But when it comes to what do you need to state in your qualitative analysis, which is allowed by NEI 96-07, Revision 1, that would enable one to answer these criteria 1, 2, 5, and 6, and to have a good basis for doing so.

What happens in NEI 01-1, instead, is Sections 4 and 5 of this document have lots of good technical bases and criteria you could apply to increase dependability and reliability, and the appendices talk a little bit about the qualification. But it's left more like a question and answer, you know, did you consider this? Did you consider that? Did you -- you know, but it doesn't tell you, now how do

you put it all together and provide a good argument for why it's a low likelihood? So this is what we're focusing on here.

The other thing is that in our previous endorsement we never took exception to anything it said in those aspects of it. Okay. So that's why this is a clarification of our previous endorsement.

By the way, we've been calling this thing RIS 2017-XX, but I think eventually it will end up being RIS 2002-22, Supplement 1, I think it will end up being. So it's easy to find it again.

Next slide, please.

Okay. So now this is the part where we're starting to get into, what do you need to do to demonstrate that you've got a very low likelihood of introducing a new failure mode or failure type or accident type or malfunction of a new type?

So what we're doing is we're focusing in on the SOCs to 96-07, SOCs to 50.59, you know, the 2001 version. And it has been interpreted in 96-07, and we have also endorsed 96-07 Revision 1 in Reg Guide 1.187.

So it has -- these are generally accepted language terms. So, but, however, just -- I'm not saying we're done analyzing all these words. This is something we're still focusing on right now. We

have -- our expert on 50.59 is Dave Bullier. I don't know if you know him, but he really knows 50.59 inside and out. So, I mean, he is very familiar with it. He is helping us with this language, so we understand that we're giving the right answer.

But, basically, we can formulate arguments based on demonstrating that the frequency of accidents and malfunctions is not increased because the likelihood of introducing a new failure is low, because the design characteristics are such that it's a highly reliable and dependable piece of equipment, and it has been applied -- things like configuration management, design and control, verification and validation processes, all these things combined, to give us a highly dependable system. And it's most likely to be much better reliability than the analog system that it's replacing.

Another thing that you can do -- so that actually -- that kind of argument would apply mostly to criterion 1 and 2. Criterion 5, one way you can do is to demonstrate that there is a potential for accidents being very low, accidents of a new type, because it might take a whole sequence of unlikely events to occur first before there is even a possibility of a new accident type. So that's an argument that

could be put together.

MR. HECHT: That's essentially a diversity in defense-in-depth argument.

MR. RAHN: That's right. That would be --

MR. MORTON: Well, more defense-in-depth.

MR. RAHN: We call it layers of defense, but, yes, that's a defense-in-depth type argument.

The other is that we can show that any residual or any possible residual defects can either be shown to be tolerated by the plant in its existing design basis, or its effects are still bounded within the existing design basis analysis results. So that's a way of answering question 6.

So a lot of things have to line up to get this far, but these are arguments that you could use.

Now, the next question is, now how do I structure an argument out of my design characteristic to arrive at these? So on the next slide what we've done is identify multiple factors -- these are not an all-inclusive list, but this is a list of things that we thought would all be used to combine to have both a technical and a qualitative basis for stating that you've got a low likelihood of occurrence of new types of malfunctions.

So the first one we talked about before,

we don't have shared resources. Another one is that we are not combining functions that have not been combined before in the existing design basis. We're also stating that the design doesn't include links or networking to communicate with other systems in the plant. It doesn't reduce independence that is already credited in the design basis.

It has attributes that demonstrate a high degree of dependability. It makes use of, as Myron just stated, multiple layers of internal and external defense. The system could have been executed using high quality development processes to minimize the introduction of new errors, and the systems have significant operating experience in similar operating environments under conditions and service duties.

MEMBER STETKAR: David?

MR. RAHN: Yes.

MEMBER STETKAR: Because these things, once people put a lot of effort into them and they finally are written down, tend to start taking on lives of their own and unintentional -- I don't know what to call it -- veracity, I guess, I recognize that this RIS is being issued as, I'll call it, a stop gap while we figure out how to do this better.

Several of the bullets here are very crisp

and distinct. That's good, I think. But if I come back to my two chillers, they absolutely don't allow me to put in a common controller for those two chillers. And I'd really like to do that five years from now.

MR. RAHN: Okay.

MEMBER STETKAR: I would really like to do that because it's going to make my life a heck of a lot easier.

Where between this RIS and eventual endorsement of NEI 16-16 and 96-07, Appendix Dog, do I wind up being able to pull the staff back from these now crisp bullets? And when I say "the staff," I mean all of the inspectors now, that we're going to train people today to say no, the answer to that is no, so, therefore, you can't do that.

MR. RAHN: Yeah. So --

MEMBER STETKAR: That's a big concern, that once we get this thing entrenched and train everybody through all of this stuff, it will be difficult to untrain them to allow me to put my common controller in.

MR. RAHN: Okay. I'll take a shot at it. And if you want to control also.

MR. LUBINSKI: Sure.

MR. RAHN: So NEI 16-16 is a document that

is being developed primarily to identify, how do I address this potential for common cause failure? And what design measures and design attributes can I apply in order to either prevent the occurrence of common cause failure or to minimize the consequences of a common cause failure.

MEMBER STETKAR: I can never present it, so I can never satisfy the first one. And just focusing on consequences is my meteorite example. We cannot divorce frequency from consequences. I can never prevent absolutely something from happening. It can never be zero. So I can never prevent it. If you're saying I can, you're lying.

MR. RAHN: Well, okay, so --

MEMBER STETKAR: No. You're lying. It has a frequency. It might be really small, it might be difficult to measure, but it has a frequency. So if you only focus on the consequences, to the exclusion of frequency, and say that the consequence of a failure in my common control system is that it can cause both of those chillers to trip, and, therefore, it's not acceptable because my deterministic design basis licensing thing didn't or somehow didn't or maybe didn't or maybe did consider that, I'm stuck in the same quandary, except now I'm five years down the road and

I still can't put in my common controller.

MR. LUBINSKI: If I could jump in, and if I can go back to your original question, this is one way that gets the scope of a small set of systems. And where your question is, does this mean that system beyond this -- and that's where I hear the concern is -- that if someone wants to combine control systems on a chiller, is somebody going to look back at this RIS and say you can't do that under 50.59.

That would be part of our communication and training, to say, no, that's not the case, it does not say that. It only says, as Dave said, under this RIS, if you're using the words in this RIS, you can't go there. You can still do that under RIS 2002-12 -- 22, sorry, and NEI 01-01, but as you heard from the industry, they would say we don't plan to do that because we believe we're at risk right now that there might not be sufficient guidance.

If they do that, we're training our inspectors that we will still look at that under the criteria of the old RIS, and existing NEI 01-01. It's not our job right now as part of this RIS to solve that issue. As part of 16-16 and Appendix D, we will resolve that issue with more clarity, but I can't resolve everything in the world by the end of July.

MEMBER STETKAR: But, John, okay, my big concern is that people will be -- this is going to happen, apparently, because there is apparently a desire on the part of the industry and the staff to check off some sort of box. So it's going to happen. People are going to be trained. In particular, folks in headquarters are going to be trained, and folks out there in the regions doing the inspections are going to be trained.

This is the way to think. This is the new think. It is really, really difficult to untrain people once you train them to a lot of specificity. And that's the big concern, that if the bigger picture is a coherent set of guidance that allows me to develop a reasonable argument that can be accepted by the NRC staff for installing my common controller for those two chillers, that's where we should be heading. We ought not to be training people on very, very specific things that we anticipate that we're going to have to untrain them.

MR. LUBINSKI: So I'm going to go back to your original statement. We are doing this. We plan on this happening, but it's not because we're checking a box. We're addressing the need of the industry right now who sat here this morning and said we feel frozen

from doing any digital upgrades under 50.59 because we don't have clear guidance.

We could wait and resolve the entire issue in the longer term, but those upgrades would remain on the shelf. We want to make sure that we have something out there that allows a subset of what can be done under 50.59 to be done sooner and with more confidence.

The concern you have is a valid one, and we need to address that through our training and our communications. That just as we issue any regulatory document, in most cases, I should say, in most of our regulatory documents, it is one way of meeting the regulation, and it's probably -- and we would look at it this way, as the more streamlined process. Does that mean you can't do beyond this under 50.59? We need to train people that that's not what we're saying. You can still do it, but don't do it by touting this RIS as the way to do it. Go to the other parts, whether it's RIS 2002-22, or NEI 01-01, and make that claim and go forward.

We've said to the industry in those cases, because of the heightened attention we have right now, if they want to -- even without this RIS, if they want to do those kind of upgrades -- and I'm going to say, combining controls on chillers and do it under 50.59

and believe they can do it -- we, as a group here at headquarters, would support that review on how they're doing it under NEI 01-01 today to make sure that if they want to do some case-by-case examples that could break things open, we would do that as well. So that's part of our communication.

MEMBER STETKAR: Okay. But, you know, we'll have to see how it works. It's --

MR. RAHN: We would all like to see how it works.

MEMBER STETKAR: Having the desired specificity for a short-term goal oftentimes puts people in a box where it's difficult to then see eventual success, and we have a lot of examples of that in this agency. So --

MR. RAHN: Yeah. That's a good point.

CHAIRMAN BROWN: Before you go on, aside from John's conundrum that you just had to deal with, these are a set of bullets that you're going to be issuing to allow people to address that, so they can get something done.

Which document are they going to end up in? 16-16? No, after the RIS.

MR. RAHN: No. So --

CHAIRMAN BROWN: 96, Appendix D?

MR. RAHN: The RIS specifies a means by which you could document within your modification package, what we call a qualitative assessment. And that's part of the mod package, and it might actually -- some people keep the 50.59s as part of the mod package. I don't know what most people do, but that's where -- where I used to work.

So that is part and parcel of a record that is pursuant to 50.59 paragraph D1, which says you must keep records of what is your technical basis for doing this.

CHAIRMAN BROWN: Oh. Actually, that's not -- my point is not that specific change that they make. Obviously, they have to keep a record of what they did. I'm saying fine, now you decide -- these are going to be subsumed. They are going to disappear. The RIS and the 01-01 are going to disappear when we translate over to the new documents, Appendix D, and 16-16. I just took a quick look, word search --

MR. RAHN: And you didn't see it in either one.

CHAIRMAN BROWN: -- and I couldn't find any of it.

MEMBER STETKAR: But that's my point is the specificity of these bullets may be contrary to the

intent of the guidance that will be developed to support 16-16 and 96-07, Appendix D, where that guidance -- that concept might be different.

The way that I think about my common controller for my two chillers might be different than these bullets telling me I can't do it.

CHAIRMAN BROWN: No, I got your point. I mean, I understand that point. The thing I -- whether I think it would be -- I'm not trying to argue desirable or not desirable. My point is, somewhere, if these are -- if you want to use 50.59, if you want to take -- I would think that if I wanted to make now a common controller for both chillers, that would fall into the LAR category as opposed to a 50.59 category.

MR. MORTON: It would fall outside the scope of RIS 2017.

MEMBER STETKAR: Of this RIS.

MR. MORTON: Of this RIS.

MEMBER STETKAR: Of those bullets.

MR. MORTON: You can use other guidance.

MR. FREGONESE: I like to make a comment. This is Vic Fregonese. So I think, in the end, this document has some limited lifespan. We'll see how long it is.

In the culmination of the negotiation over

what is in NEI 16-16 will result in some of these staying and some going away. So, for instance, if we have a near-term prohibition on shared resources and we have to talk more about what that means, in NEI 16-16 there is a description of what to do if you have shared resources, and what defensive measures to use to not have shared resources.

So there is some combination of those that would be -- that would be discussed. Or, if we have some run time with the RIS and we kind of like something that's in there, then maybe we say, hey, this is a really good idea. We'll put it in 16-16 in, you know, Appendix B2, or somewhere, and then eventually some of the stuff that's kind of a near-term restriction, so you all have drawn a box that you want to stay in kind of.

Maybe the box gets bigger. We want it to be a lot bigger probably than you do, but the box would get bigger. And, anyway, that's kind of what my thinking is.

The other comment will be, which we can talk about Thursday, is some of the stuff looks a little bit different, obviously, than we talked about before.

And I see a lot of stuff in here about design defects, and that's something that I'm very interested in talking about later. So if you want to

make a comment on it, fine. Otherwise, we'll come up with some questions for Thursday.

That's the end of my comment.

MR. RAHN: All right. So, yeah, go ahead.

MR. HECHT: A question on the quality measures. They have been left pretty general. So if my inspectors say, well, if you haven't done structural testing down to the path level, your software isn't of adequate quality to pass that criterion, will you -- do you have any more guidance, or what do you say?

MR. MORTON: Part of that bullet is subsumed within the overall concern with documentation. So a number of things that the inspectors have identified, and even some of the things that the licensees have provided us input and feedback on is the inadequate documentation of design basis of the proposed modification.

Therefore, if you are relying on whatever codes and standards -- or whatever recognized codes and standards you use to implement this modification, either the adequate documentation of that particular standard that was used was not there, or there wasn't any sort of evaluation of why the standard was sufficient that it provided you a level of confidence in the quality or design control of the modification

itself.

So that's where that bullet is coming from, and there is additional enhanced guidance on that point, in terms of the systems of varying safety significance, what would be a good quality measure. And that's something we're still working with the industry to develop and refine, so that independent parties, as in the licensee and inspectors or anyone else who picks up the 50.59 evaluation, can come to a similar or the same conclusion if they're looking at it differently, if evidence is presented in terms of the quality measures provided for that modification.

MR. HECHT: It sounds like we are converging on 61.508 and different levels of safety integrity.

MR. RAHN: Not yet. Not yet. Maybe one day it will get there.

MR. MORTON: So NEI 01-01 has a little bit of wording in there in terms of the documentation should be commensurate with the level of safety significance or the particular SS should be modified. We simply build upon that point.

Now, it's a bit of a complicated issue because it was complicated back when we identified it back in 2013, so we're still work through that

particular topic and we'll probably be talking about that on the Thursday workshop when we actually run through the RIS itself.

MR. HECHT: Okay. If I can just point out another industry, there is a standard in avionics called RPCADO-178 and 278. Basically, you have defined five levels of -- they call them software levels, which are related to hazard levels, which basically, among the 66 practices, they call them objectives, are graded by the significance of the function being implemented. And it might be -- you might choose to go to something like that for the quality, I'm not sure.

MR. RAHN: I think what we're saying is that for -- you know, if it's not a safety-related function, for example, we may have an industry standard for development, an ISO-9000, you know, some other quality process. It's not necessarily the ones that are endorsed, processed, they are endorsed methods in the reg guides, for example.

But it's up to the person writing this qualitative assessment as to why that particular standard is considered adequate to achieve the low reduction in uncertainty that is needed to say that it's okay to imply -- that this particular modification will

not have a likelihood of a defect or malfunction that's of the same order of magnitude as those assumed in the design basis.

MR. HECHT: Okay. Thank you.

MR. RAHN: The next slide?

So the next two slides are -- these are words that we are -- Wendell just kind of mentioned we are developing -- like the back end of this RIS will have a -- kind of like a methodology for performing the preparation and the documentation of a qualitative assessment. And in there, we are saying that the selection of the design standards, or portions thereof to be employed, should be commensurate with the level of safety significance of the modified component and the possible consequences of it.

So it's kind of a graded approach based on level of safety significance. And so what we're saying is that the end result of this qualitative assessment is a document that presents how all those design attributes, quality measures, and operating experience combine, and maybe the reliability of the software tools that are used, how do all of those combine to demonstrate that there is a significant reduction in the likelihood of introducing new defects, and that the effects of any of those residual failures or defects

could be tolerated within the design basis or be bounded by the existing analysis. So that's the approach we're proposing.

MEMBER STETKAR: So I hope to demonstrate that I have reduced the likelihood of introducing new defects, despite that those new defects might be irrelevant.

MR. RAHN: You have to demonstrate why they are irrelevant.

MEMBER STETKAR: Okay.

MR. RAHN: And if your design control process --

MEMBER STETKAR: This comes back to my, if it's -- if the likelihood that my two chillers fail, common cause, from the mechanical relay, circuit breaker, whatever you want to have, is number X. And any conceivable contribution from my common control system is a very, very small fraction of X. Despite the fact that I used to think it was zero, and I was wrong, I still should get away with allowing my common control system to be installed; shouldn't I? I've introduced a new thing.

MR. RAHN: I would say --

MEMBER STETKAR: It's not a zero failure because nothing has zero failure. It's just that it

doesn't make any difference. It just doesn't make any difference when I think about frequency and consequences, not frequency alone, in isolation, and not consequences alone, in isolation.

MR. RAHN: So within your -- if your design basis allows that, then you should be able to use that kind of argument. But the problem that I see with that is that you don't have a generally accepted method for identifying, what is that frequency.

So, in other words, how low is low enough? 10-14, or, you know, I mean, it's like what is your technical basis for identifying that low frequency? And is that something that other people would agree with? And is it some generally accepted principle for coming up with it?

MEMBER MARCH-LEUBA: Let me ask a completely different question. Does the methodology give any credit to the industry for continuous improvement, for proven experience?

Let me give an example. Microsoft issues Windows, and every other week they send an update to correct it.

MR. RAHN: Yes.

MEMBER MARCH-LEUBA: So the first implementation of the chiller we have an undetected

flaw, and it will get found, it will get taken away.

MR. RAHN: Right.

MEMBER MARCH-LEUBA: So you are -- you are tempted at the beginning to use a frequency of failure based on that undetected failure that continues forever when really it's only the time to the first failure, and in all other plants --

MR. RAHN: Right. They --

MEMBER MARCH-LEUBA: -- their frequency is going down, down, down, down, down.

MR. RAHN: Right.

MEMBER MARCH-LEUBA: So how do we account for that?

MR. RAHN: Yes. So we have -- did we put it in? We have a section on operating experience, and what we're doing is we're giving credit for it; they just have to kind of process it. Many vendors have a continuous process improvement program, and so failures that are identified in the field go back and are factored in and they will -- the vendor improves it.

MEMBER MARCH-LEUBA: The way I see it, it's not a frequency of failure, but the time to the first failure on any implemented system, which is a completely different mathematical concept.

MR. RAHN: Yes, it is. Thank you.

So the long and short, yeah, we can go on. But the gist of this is to demonstrate qualitatively that you have all these technical and qualitative factors that combine to give you that reasoning needed to answer these tricky 50.59 questions.

So here is the schedule we're on. We started -- Wendell and I started this in March. We talked about this a little earlier. We were able to share our March 28th version with stakeholders. We could factor in many of their comments already.

We did have a public meeting about it on March 30th. We had a subsequent draft, and we are -- we actually have a second public meeting on it already, too. So those -- you know, it's evolving. So the point we're at currently is that we've put our pencils down, and we have our in-house processes looking at this document right now, so -- including our Office of General Counsel.

I never get anything back from them that's not completely marked up. So I am anticipating spending a couple of days resolving OGC's comments.

But we're planning on having an FRN come out next week, but as soon as it is available on ADAMS we will share it with our stakeholders to get it to them

in time for -- to support next week's meeting.

MR. LUBINSKI: With respect to -- Dave mentioned the FRN, as soon as we finalize the document, he said a couple days. I'm a little more optimistic. I think OGC is going to be providing those comments today as well as final stakeholders. Hopefully, we'll have everything resolved tomorrow. But the minute the document is ready to go into the Federal Register, there is an administrative process internally that takes a few days.

In parallel, we'll put it in ADAMS, make it public, and that's why we have -- still have a target date of May 19th, this Friday, to have it in ADAMS as a publicly available document. That's what we're shooting for. It gives the industry six days to look at it. We appreciate their flexibility.

As Vic said, there's a couple things new they saw on the slide today, but I think the majority of the stuff is not going to be as -- a new rock that we are bringing to them. It's a little bit of a polishing of what we had, so it shouldn't be a surprise. So we're looking forward to the meeting next week.

I did want to take an opportunity right now, we've talked about the timeframe and how aggressive this has been with March through today. And

there's four people I clearly want to call out, and that's Wendell, Dave, Vic, and Neil, from the industry side.

I have appreciated the exchange we've had back and forth. We both asked for comments and resolutions pretty quickly and some short turnaround times. So I appreciate it would not be where it is today and I would not be as confident about something going out in July if it wasn't for that great interaction and communication between everyone.

And as the gentleman at the table said, there is support from many other staff members as well, including the regions, and we appreciate the fact that they have been able to make this a priority. And as you can imagine, when you ask someone to start engaging in weekly meetings with you on something, and they do it, they are seeing some type of benefit to it as well, and we appreciate all their input.

I think, with that, that concludes the staff's presentations for today, and we'll continue with comments and questions.

CHAIRMAN BROWN: Okay. Yeah, I still have a comment to my -- this esoteric discussion that we went through on common, shared, and how we don't have to -- your list of stuff on slide 9, which I asked a

question about, where will they appear, the answer was nowhere. I think that's what I read. I know the risk disappears.

But if I was a licensee, and I wanted to make sure a system that I wanted to replace, like the chillers or the diesel generator, voltage regulators, or whatever, and I wanted a smooth, easy pass for ensuring that I didn't blow all of my engineering talent away, I would look at a list like this and say I'm going to make sure I meet all of these, regardless of what -- whether the risk has disappeared or not, and would make the assumption that I could sell my thing with minimal effort via the new Appendix D and 16-06 type documents.

And yet the -- I mean, I don't -- I'm not worried so much about justifying why I want to have a single microprocessor develop all four channels of protection functions and issue it out to trip a set of breakers, and only have one because I can justify based on some other esoteric analysis that looks no different than my old one, which it is obvious that it does, but that's beside the point.

So it troubles me -- not troubles, that's the wrong word. It would seem to me useful from an industry standpoint to have s clear, concise set of

defensive measures, which these are effectively, that says my new stuff will work as good and/or better than the old stuff, so let's get on with it, and they're not going to appear anywhere. I looked in NEI, Appendix A, and their defensive measures is empty right now, or at least the version we have.

MR. RAHN: Yeah. They have now included wording that you might see that -- similar to what appeared in an EPRI design guide.

So my understanding of NEI 16-16 is that it will have what they call terms that you could use for preventive or limiting measures that would enable you to, if you had these things, here's how you deal with them.

CHAIRMAN BROWN: Yeah. But there's -- it's not in there anywhere. There's only a couple of comments.

MR. RAHN: Appendix A does have a few of them in there, or actually -- quite a few actually. When you see it, it will -- you probably won't see it until next week, until it's in ADAMS.

MR. LUBINSKI: I think the current version of the document you have, Chairman Brown, is the previous version, not the December --

CHAIRMAN BROWN: I recognize that. I'm

not complaining. That's not the point. It's just that I was -- when we go on to these more what I call convoluted arguments or discussions on some unusual configurations, that why won't you allow me to use a shared controller for my two chillers. That's nice, okay, I guess we could argue about that.

And John is correct in that you should allow it if somebody can come up with an adequate justification and, therefore, the document ought to reflect that. But it seems to me it also ought to reflect what I call the interstate highway or getting something done as opposed to having to take all of the old U.S. 60 and U.S. 1s and go through every township to get there.

MR. MORTON: We actually use the EZPass analogy versus going through the pay toll when it comes to this RIS scope versus 2002-22. So --

CHAIRMAN BROWN: What did you say, pay toll?

MR. MORTON: They've got to pull money out and wait for it, they've got to wait in line, whereas EZPass you just keep on driving.

CHAIRMAN BROWN: Well, in some places, like West Virginia, if I don't slow down to one mile per hour, I get a photograph taken.

(Laughter.)

MR. MORTON: So these bullets make you slow down a little bit.

MR. RAHN: But to answer your question, though, I think currently NEI 16-16, the focus is, how do you deal with CCF?

CHAIRMAN BROWN: And that's what these -- fundamentally, these defensive measurements will --

MR. RAHN: Correct.

CHAIRMAN BROWN: -- one way or the other.

MR. RAHN: It doesn't have a section on, how do you construct an argument? And it says here's how I can credit all of these attributes and quality measures to say that my system is highly dependable.

So that's on question. It may be, we don't know, is Appendix D the place for that? Is NEI 16-16 the place for that? Anyway, it's a good point you're raising.

MR. LUBINSKI: John Lubinski. I appreciate the comment, and I think it's a good one, and I'd say at this point it's a little bit too early to say, because, again, the -- even at this point, the current version of the RIS, the industry hasn't seen it yet. We would hope that some of the ideas in here

use an EZPass of, yeah, this is the easier way to do it.

Maybe some of that methodology makes it into Appendix D or 16-16, and helps to get it in an easier way, but I think that is also going to be incumbent upon the benefit that the industry sees from it. So, and they were working on 16-16, the current version we have, in parallel to what we're doing.

So we're trying to bring these together as we move forward, but we need to consider that and ask ourselves the questions before we retire these documents in the future.

CHAIRMAN BROWN: Okay. What I'm going to do now, I was going to go around the table first. Do you want me just to wait on that, publicn first? Okay. But I always lose the bubble.

Is there anybody in the room that would like to add their points or comments or point of views? There's a microphone. Is there anyone in the room -- can you hear me now -- that would like to speak to the issue? I think the answer appears to be no, so I'll take that as a no.

Is there anybody on the phone line right now? Is the phone line open?

MEMBER BLEY: Just ask for comments.

CHAIRMAN BROWN: Is there anybody on the phone line that has some comments on today's subcommittee meeting and the discussions?

MR. SCAROLA: Yes. Hello. This is Ken Scarola. I do have a comment.

CHAIRMAN BROWN: Okay. Ken, go ahead.

MR. SCAROLA: Thanks, Charlie, for the opportunity to comment. I really appreciate it.

My comments pertain to the draft RIS, and I've got two comments. The first is I'm concerned about ambiguity in the draft RIS.

Excuse me. There is a lot of paper shuffling going on. Can everybody hear me?

CHAIRMAN BROWN: Yes.

MR. SCAROLA: Okay. In the last bullet on slide 6 of the staff's presentation, which reflects the draft RIS, it seems to require that a design defect be assumed, postulated to be triggered, and then the malfunction result analyzed. This is restated slightly differently, but with the same thought, in the last bullet of slide 8.

I fully support this position in the RIS because until industry and staff reach agreement on design attributes that can be credited to preclude malfunctions due to a design defect, and that would be

through NEI 16-16, the only deterministic design attributes that the staff currently endorses are simplicity, as demonstrated by 100 percent testability, and internal diversity, both of which are identified in BTP 719.

Therefore, for me, requiring a results analysis, or, as John Stetkar says, a consequence analysis, from a potential malfunction due to a design defect, is a reasonable position in the RIS.

The ambiguity that I'm concerned about comes in through the words "if any" in this same bullet on slide 6, because these words imply that a conclusion can be reached that no further consideration of a malfunction due to a design defect is needed, and this conclusion can be reached not through one of the deterministic design attributes in BTP 719, but through the qualitative assessment process that is the foundation of this RIS.

I see this same ambiguity on slide 11 in the words "any residual defect," because, again, these words imply that there may not be a design defect as concluded through only a qualitative assessment and, again, without one of the deterministic design attributes in BTP 719.

Therefore, I strongly request that this

ambiguity in the draft RIS be removed before this RIS is finalized. The RIS should be very clear that a design defect should be assumed, it should be postulated to be triggered, and the resulting malfunction analyzed, unless that malfunction is precluded through simplicity or internal diversity.

Now, I know I've said an awful lot here, and I know I'm expressing my conservative after being a digital designer in this industry for more than 40 years. But I hope that industry and staff can quickly expand the list of creditable design attributes that are currently in BTP 719 by accelerating the endorsement of NEI 16-16, because there are certainly other technically sound and viable defensive measures that can preclude new malfunctions, even due to a design defect.

That was my first concern. Are there any comments or responses to that one?

CHAIRMAN BROWN: Sorry. We'll take your comments, and that's what we do. We don't -- we don't go back and forth in this -- at this point.

MR. SCAROLA: Okay. So my next concern, also about the draft RIS, is about insufficient information and clarity. The last bullets on slides 6 and 8, and the bullet on slide 11, discuss

demonstrating that a malfunction due to a design defect is bounded. But the current draft RIS, as well as NEI 01-01 and NEI 96-07, are silent on what it means to be bounded, and silent on the acceptable analysis methods that can be used to demonstrate bounded.

For low likelihood defects, the SRM to SECY-93-087 and BTP 719, allow the resulting malfunction to be considered beyond design basis. This allows best estimate analysis methods, relaxed acceptance criteria, and malfunction mitigation using non-safety systems.

The RIS, in order to be effective for the industry, needs to be clear that these same criteria are acceptable to demonstrate bounded for low likelihood events for the 50.59 evaluation.

The RIS also needs to explain what "bounded" means. For example, "bounded" may mean no more than a minimal reduction in margins of critical safety function limits. The RIS also needs to distinguish this methodology and acceptance criteria for a beyond design basis malfunction from the criteria used for demonstrating that a design basis malfunction is bounded.

Certainly, the design basis criteria should be explicitly more conservative than the beyond

design basis criteria.

Finally, the RIS needs to state that a bounded result facilitates a no answer to 50.59 question 6. A no answer means there is not a malfunction with a different result.

All of this additional information and clarity is needed in the RIS because the staff has criticized industry for lack of consistency in 50.59 evaluations. We will never get that consistency if there is not clear and complete guidance. Therefore, I request this additional information and clarity be added to the RIS before it's finalized.

Thank you.

CHAIRMAN BROWN: Okay. Thank you very much, Ken.

Are there any other comments from any other individuals on the phone line?

Okay. Hearing none, does this get closed automatically? Okay. Checking here.

We'll go around the table, see if there's any outstanding comments. Jose?

MEMBER MARCH-LEUBA: No further comments.

MEMBER STETKAR: Nothing more. Thank you.

CHAIRMAN BROWN: Okay. John? Dennis?

MEMBER BLEY: Yeah, I do. First, I would like to thank everyone for their presentations today. I know Charlie will do that, too, but you guys have been addressing some pretty tough questions, and you've given a lot of thought to this, and I appreciate that, and I appreciate the exchange today. In fact, I have already sent a note to Christine asking for the transcript of this meeting as soon as it's available, because I think there is some very interesting stuff there.

That said, and that's really positive, so don't take the rest of this too negative, I think the NEI folks and the people they work for and the staff would be well served by coming up with another word for this credible thing that is a well-defined English language word, and it's being used in ways that aren't right there, you know, something that means something like "can be neglected," because that's what you really mean here.

The second one is -- and I've commented on this a few times -- it's -- I guess it's unfortunate how 50.59 changed, and it has forced people into very convoluted logic that is uncomfortable. But the last two talks gave me hope that at least for limited sets of kinds of equipment you have a path out of that. It

remains to be seen if it's really an EZPass, so the exercise next week will be very interesting to follow.

Now, the last one is kind of general and high level. It seems to me -- I'm worried we will be back here in 10 years -- not us, but Jose may be running the meeting then, saying, "I thought I heard some of this stuff 10 years ago," and ask you to think of trading some process for substance.

And I know you've got some workshops set up, but 10 years of building better and better guidance will still lead us, when we really try to use it, into holes. And, you know, if I were king, what I'd do is tell the industry guys to come with a passel of real-world examples that they need solved, and then I'd put a dozen of you guys all in a room somewhere far away, maybe in Fargo or Bay City or even Adak, and nobody comes out until the smoke rises and you've worked out things that work.

And then you've taken what works and gone back and revised the guidance to reflect what really works. I think you've just got to start applying rather than sitting here dreaming about it, and the more applying you can do the more it will let you revise the guidance into a way that will really work. And I think without that hands-on, we never get there we just think

we're getting there and then we run into troubles again and again and again. We've seen it not just in I&C, we've seen it in fire, we've seen it all over. And, actually, making it work is the key.

Sorry for the rant, but I hope you get it.

CHAIRMAN BROWN: Matt?

MEMBER SUNSERI: I appreciate all the presentations today by the staff and industry. I have no additional comments. Thank you.

CHAIRMAN BROWN: Myron?

MR. HECHT: No additional comments.

CHAIRMAN BROWN: All right. I guess I'll make just some limited. Number one, I really enjoyed the discussion today, the presentation of a lot of divergent and different viewpoints, I think which add -- which add a lot of value to the overall discussion. It wasn't just a one size fits all, so -- and I came away feeling you guys were very well prepared for answering the questions that were asked.

I mean, there were some knotty, thorny items, obviously you haven't come through yet, but I view this was very information and very useful for us as a subcommittee, as an information briefing on this overall subject.

I made my comments earlier. I will not

repeat them. I still feel strongly about your slide 9 bullets. All right. I just think you ought to have a super highway described as well as cover the more generic ones in some other way, but I can't tell you what to do, so that's -- obviously, we'll get what we get.

So, other than that, if there are no other comments, we will adjourn the meeting. Okay. Thank you all very much.

(Whereupon, the above-entitled matter went off the record at 3:43 p.m.)

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Integrated Action Plan for the Modernization of the NRC's Digital I&C Regulatory Infrastructure

Staff Briefing to the Advisory Committee on Reactor Safeguards Digital Instrumentation and Control Systems Subcommittee

May 17, 2017

Discussion Topics

- Key Messages
- Integrated Action Plan (IAP) Strategy for Digital I&C Modernization
- SRM-SECY-16-0070 Actions
- Current Industry Perspectives
- Digital I&C Key Events Timeline
- Modernization Plans (MPs)
- MP #1 - Protection Against Common Cause Failures (CCF)
- MP #2 - Considering DI&C in accordance with 10 CFR 50.59
- MP #3 - Acceptance of of Digital Equipment
- MP #4 - Assessment for Modernization of the I&C Regulatory Infrastructure
- Remaining Discussion

Key Messages

- Staff has undertaken activities approved under SRM-SECY-16-0070 to modernize the digital I&C regulatory infrastructure
- Staff activities are focused on tactical and strategic outcomes
- Industry is concerned that activities to date have not enabled implementable results
- Staff is working with industry to produce implementable guidance by Summer of 2017
- Frequent staff engagement in public workshops and meetings with industry and other external stakeholders to reach a common understanding of the digital I&C regulatory challenges, priorities, and potential solutions to address them

IAP Strategy for DI&C Modernization

- Objective: Modernize the digital I&C regulatory infrastructure to enhance the NRC's capability to be more timely, efficient and effective in ensuring safety, and provide a consistent and predictable regulatory process
  - Tactical - Continue to prioritize and implement the regulatory activities needed to provide regulatory clarity and support industry confidence to perform digital I&C upgrades (MPs# 1-3 and MP# 4A)
  - Strategic - Assess and implement broader modernization of regulatory infrastructure (MP# 4B)

SRM-SECY-16-0070 Actions

- Commission paper: October 25, 2017 (annual update)
- Semi-annual Commissioner Assistants briefs
  - 1st brief held on June 6, 2016
  - 2nd brief held on January 30, 2017
  - 3rd brief targeted for week of June 26, 2017
- Frequent stakeholder interactions
- The staff has determined that there are no policy issues ready for Commission consideration at this time

Current Industry Perspectives

Industry Identified Successes to Date:

- NRC Digital Action Plan and interactions between staff and industry are significant
- Publication of EPRI CCF Guideline (3002005326) published in April/made available in July of 2016
- Submittal of draft NEI 96-07 Appendix D (50.59) in April 2016
- Submittal of partial draft NEI 16-16, *Guidance for Addressing Digital Common Cause Failure (concept)*
  - *Draft1: December 2016*
  - *Draft 2: May 2017*

Current Industry Perspectives (Cont'd)

What Industry is Dissatisfied With:

- Industry ready to make digital modifications but unable to due to significant adverse economic impacts - regulatory uncertainty
- Regulatory uncertainty prohibits/limits digital modifications even to SR support systems (e.g. chillers) to improve efficiency
- Lack of results is causing industry to lose confidence - near-term (Summer 2017) results are necessary

Digital I&C Key Events Timeline

Action	Date
SECY-15-0106 Request for incorporation of IEEE 603-2009 submitted to Commission	August 2015
Commission Briefing	December 2015
SRM-SECY-15-0106 Incorporation of IEEE 603-2009 was not approved	February 2016
Public Meeting - Common Cause Failure	March 2016
Draft NEI 96-07 Appendix D submitted to NRC for review (50.59)	April 2016
Public Meeting - 10 CFR 50.59	April 2016
SECY-16-0070 Integrated Action Plan submitted to Commission	May 2016
Commission Assistant Brief	June 2016
Public Meeting - Common Cause Failure	June 2016
Public Meeting - 10 CFR 50.59	June 2016
Common Cause Failure NEI Table Top	July 2016
Common Cause Failure NEI Table Top	August 2016
Public Meeting - 10 CFR 50.59	August 2016
Public Meeting - Common Cause Failure	September 2016
SRM-SECY-16-0070 Integrated Action Plan approved	October 2016
Public Meeting - 10 CFR 50.59	November 2016
NEI 16-16 Draft 1 submission to NRC for review (CCF)	December 2016
Public Meeting - Common Cause Failure	December 2016

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Digital I&C Key Events Timeline

Action	Date
Public Meeting - 10 CFR 50.59	December 2016
Public Meeting - 10 CFR 50.59	January 2017
Commission Assistant Brief	January 2017
Public Meeting - Common Cause Failure	February 2017
Public Meeting – Commercial Grade Dedication	February 2017
Public Meeting – IAP Revision 1	February 2017
Public Meeting – Regulatory Infrastructure: Tactical Modernization	February 2017
Public Meeting - 10 CFR 50.59	March 2017
Public Meeting - Common Cause Failure	March 2017
Public Meeting – Draft Regulatory Issue Summary	March 2017
Public Meeting - Common Cause Failure	April 2017
Public Meeting – Regulatory Infrastructure: Tactical Modernization	April 2017
Public Meeting - 10 CFR 50.59	April 2017
Public Meeting – Draft Regulatory Issue Summary	April 2017
NEI 16-16 Draft 2 submission to NRC for review (CCF)	May 2017
Public Meeting – ACRS Subcommittee Briefing	May 2017
Public Meeting – Draft Regulatory Issue Summary (Tabletop Exercise)	May 2017

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Modernization Plans (MPs)

- **MP #1 - Protection Against Common Cause Failures (CCF)**
  - Focus: Development of guidance for using effective qualitative assessments of the likelihood of failures, use of defensive measures, bounding and coping analysis, and evaluation of the NRC's existing positions on protection of DI&C components and systems against CCF.
  - Subdivided in to MP #s 1A, 1B and 1C
- **MP #2 - Considering Digital I&C in accordance with 10 CFR 50.59**
  - Focus: Address the need for mutual clarity between industry and NRC staff to ensure NRC guidance is being properly translated into industry actions while performing 10 CFR 50.59 evaluations of digital I&C upgrades.

Modernization Plans (MPs)

- **MP #3 - Acceptance of Digital Equipment**
  - Focus: Identify needed improvements to the regulatory infrastructure to ensure the implementation of digital devices is being appropriately evaluated by licensees, applicants, and suppliers (compliance with regulations and policy)
- **MP #4 - Assessment for Modernization of the Instrument & Control Regulatory Infrastructure**
  - Focus: Comprehensive modernization assessment to identify further improvements to the regulatory infrastructure and develop plans for accomplishing such improvements.
  - Subdivided into MP #4A (Tactical Modernization) and MP #4B (Strategic Modernization)

MP #1 - Protection Against Common Cause Failures (CCF)

- Key Attributes:
  - CCF can compromise the independence across redundant divisions, across echelons of defense, and across monitoring and monitored elements.
  - NRC position is defined in SRM-SECY-93-087 item II.Q, and guidance is provided in BTP 7-19.
- Objectives:
  - MP #1A - Develop guidance enabling proper implementation of simple digital upgrades and replacements under 10 CFR 50.59 by summer, 2017.
  - MP #1B - Evaluate industry's proposed guidance in NEI 16-16.
  - MP #1C - Evaluate need to modify NRC policy (SRM-SECY-93-087), regulations, and guidance concerning CCF related to digital I&C systems.

MP #1 - Protection Against Common Cause Failures (CCF)

- Activities:
  - MP #1A - Developing RIS 2017-XX to clarify staff endorsement of NEI 01-01 pertaining to preparation of qualitative assessments as a technical basis supporting the 50.59 evaluation process.
  - MP #1B - NEI submitted a partial draft of its guidance for addressing digital CCF in NEI 16-16 in December 2016. Staff provided comments in March 2017. NEI 16-16 [Draft 2] was received May 12th 2017.

MP #2 - Considering Digital I&C in accordance with 10 CFR 50.59

- Key Attributes:
  - Staff intends to clarify guidance and reduce licensing uncertainty through review of NEI 96-07 Appendix D
  - Obtain agreement between NRC and industry on key sections of Appendix D (Screening, Evaluation)
- Objectives:
  - To ensure there is adequate guidance for 10 CFR 50.59 evaluations of digital I&C upgrades in order to reduce licensing uncertainty and clarify the regulatory process.

MP #2 - Considering Digital I&C in accordance with 10 CFR 50.59

- Activities:
  - Receipt of NEI 96-07 Appendix D draft in April 2016
  - NEI submission of revised “Evaluation Guidance” section in February 2017
  - Formal staff comments on “Screen Guidance” section provided March 2017
  - Continued interface with NEI on Appendix D development

MP #3 - Acceptance of Digital Equipment

- Key Attributes:
  - I&C and other digital equipment readily available do not meet 10 CFR Part 50 Appendix B QA requirements
  - Industry and NRC staff are seeking efficient and effective means for acceptance of commercial grade digital equipment in accordance with 10 CFR Part 21
- Objectives:
  - Improvements to regulatory infrastructure for acceptance of commercial grade digital equipment for safety applications

MP #3 - Acceptance of Digital Equipment

- Activities:
  - RIS 2016-05 issued to address embedded digital devices
  - Draft RG DG-1292 issued that address dedication of commercial grade items
  - EPRI researching use of SIL certified digital equipment in safety applications

MP #4A - Tactical Modernization

- Key Attributes:
  - Digital I&C modifications via licensing amendment requests or under 50.59
  - Identification of licensing actions to apply MP #1-3 and #4A guidance
- Objectives:
  - Build upon MP #1-3 activities
  - Refine guidance for digital I&C modifications via licensing amendment requests or under 50.59
  - Develop corresponding inspection guidance

MP #4A - Tactical Modernization

- Activities:
  - Meet with industry to create detailed plan to produce new digital instrumentation and control licensing guidance
  - Prioritize the complete set of MP #4 activities to create detailed plans
  - Identify licensing actions to apply MP #1-3 and #4A guidance

MP #4B - Strategic Modernization

- Key Attributes:
  - Broader assessment of the digital I&C regulatory infrastructure
- Objectives:
  - Enable large-scale safe adoption of digital I&C through a broader modernization of the regulatory infrastructure to be more performance-based, technology neutral, simplified, streamlined and agile

MP #4B - Strategic Modernization

- Activities:
  - Limited to discussion of the priorities of proposed activities for inclusion under the strategic (versus tactical) scope
  - Will characterize and evaluate regulatory infrastructures (perform a broad assessment)
  - Will identify the future modernized infrastructure
  - Will update the infrastructure to modernize it

Remaining Discussion

- NEI 96-07 Appendix D (50.59 process for digital I&C upgrades): Staff perspectives and progress updates
- NRC Regulatory Issue Summary: Update to the previous staff endorsement of NEI 01-01 (RIS 2002-22)

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ACRS Briefing – MP#2 Activities with Draft NEI 96-07 Appendix D

50.59 Working Group Status Update

Wendell Morton

May 17, 2017

Key Messages

- Draft NEI 96-07 Appendix D and NEI 16-16 replace the licensing and technical guidance (respectively) of NEI 01-01 for licensing activities under 10 CFR 50.59

- Draft Appendix D provides significant changes from the current licensing guidance in NEI 01-01

- Staff continues frequent engagement with NEI to resolve any remaining issues resulting in steady improvement for subsequent draft Appendix D revisions

10 CFR 50.59 Background

- Purpose: Establishes the conditions under which licensees may make changes to the facility, procedures and conduct tests or experiments without prior NRC approval

- 50.59 does NOT provide for the final determination of safety for a proposed activity

- 50.59 controls for changes to the ***design bases*** (subset of licensing bases) as defined 10 CFR 50.2

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10 CFR 50.59 - Screening

- Screening is the process for determining whether a proposed activity requires a 10 CFR 50.59 evaluation to be performed

- "Adverse Effects" – Changes that can adversely affect design functions or methods to perform or control design functions

- Adverse changes have the potential to increase the likelihood of malfunctions or create new accidents

10 CFR 50.59(c)(2) - Evaluation

- Purpose: The evaluation questions are used to evaluate the effects of proposed activities on accidents/malfunctions previously evaluated in the FSAR and their potential to cause accidents/malfunctions whose effects ***are not bounded by previous analyses***.

- If any of the (8) questions have a 'yes' answer, a license amendment must be obtained.

- The evaluation questions of most concern are questions 1, 2, 5, 6.

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Evaluation Questions

- Question 1: Does the activity result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the UFSAR (10 CFR 50.59(c)(i))?

- Question 2: Does the activity result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the UFSAR (10 CFR 50.59(c)(ii))?

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Evaluation Questions

- Question 5: Does the activity create a possibility for an accident of a different type than any previously evaluated in the UFSAR (10 CFR 50.59(c)(v))?

- Question 6: Does the activity create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the UFSAR (10 CFR 50.59(c)(vi))?

Brief History of Draft NEI 96-07 Appendix D

- Regulatory Information Summary (RIS) 2002-22 provides the NRC staff's endorsement for the use of NEI 01-01, the current 50.59 licensing guidance specific to digital instrumentation and controls (DI&C)
- Experience with NEI 01-01 revealed several shortfalls in the screening of modifications, evaluating the impact of proposed digital I&C on established licensing bases (e.g. common cause failure (CCF)) and documentation resulting in licensing uncertainty for both industry and staff
- In a November 2013 letter to NEI (ADAMS Accession No. ML13298A787), the staff summarized its concerns regarding licensee implementation guidance in NEI 01-01
- April 2016, NEI provided draft Appendix D to NEI 96-07 to the staff for review and endorsement

10 CFR 50.59 Guidance Documents

- NEI 96-07 Revision 1 (as endorsed by RG 1.187) is the generic guidance for 10 CFR 50.59 licensing activities

- NEI 01-01 (as endorsed by RIS 2002-22) contains both 50.59 licensing guidance AND technical guidance. It supplements NEI 96-07 specifically for digital I&C.

- NEI's intent is to retire and replace NEI 01-01 with Draft NEI 96-07 Appendix D (Licensing Only) and NEI 16-16 (Technical Only)

Draft NEI 96-07 Appendix D Purpose

- Draft Appendix D is a supplement to the base guidance provided in NEI 96-07 and is specific to digital I&C licensing activities
- Draft Appendix D provides enhanced guidance on areas such as:
  - "combination of functions"
  - human-system interface (HSI)

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Draft NEI 96-07 Appendix D Structure and Content

- There are five sections to Draft Appendix D
  - Section 1.0 – Introduction / Background
  - Section 2.0 – Definitions
  - Section 3.0 – Screen Guidance
  - Section 4.0 – Evaluation Guidance
  - Section 5.0 – Examples

- Draft Appendix D contains licensing guidance ONLY (no technical guidance)

Draft Appendix D
Key Screening Concepts

- Introduction of software or digital technology is not "adverse" by default

- "Digital modification that would reduce SSC diversity, separation, independence, defense-in-depth and/or redundancy is *adverse.*"

- Modifications to HSI do not automatically 'screen in'

Draft Appendix D
Key Evaluation Concepts

- Common cause failure (CCF Outcomes)
  - CCF credible
  - CCF not credible
    - CCF Likelihood *much lower than* Single Random Hardware Failure Likelihood
    - CCF Likelihood *NOT much lower than* Single Random Hardware Failure Likelihood
- Determination of Attributable

- Determination of Magnitude (Negligible or Discernible)

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Draft NEI 96-07 Appendix D Review Challenges

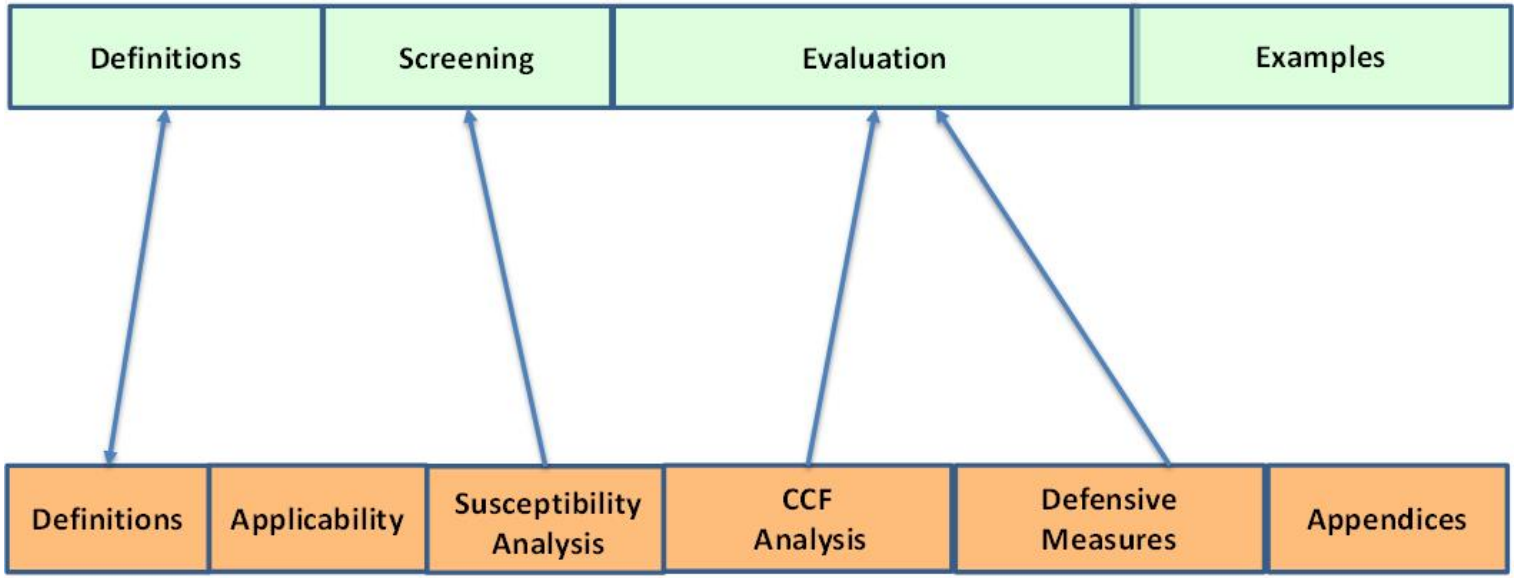
- Key areas of concern include:
  - Differences in HSI guidance between draft Appendix D and NEI 01-01 (screening section)
  - Un-resolved key considerations (e.g. EMI/RFI acknowledgment in screening section)
  - Clarification of CCF outcomes discussion (evaluation section)
  - Understanding Interface between draft Appendix D and NEI 16-16 not defined to date
- Staff and NEI interact regularly to resolve and close remaining open items

Interface between Draft NEI 96-07 Appendix D and NEI 16-16

- Three primary staff concerns:
  - Consistency of Terminology: Terms and definitions that do not necessarily translate between documents (e.g. “negligible”)
  - Mapping: Not clear how NEI 16-16 can be used to answer 50.59 screening or evaluation criterion (draft Appendix D)
  - Potential inappropriate use of best estimate methodology to address 50.59 criterion

Guidance Document Structure Mapping (?)

Appendix D – Guidance for 50.59 Licensing Process



NEI 16-16 – Guidance for Assessing CCF

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Schedule for MP#2

Activity		Schedule
1.	Receive NEI guidance document, Appendix D 96-07, Guidelines for 10 CFR 50.59 Evaluations.	April 4, 2016 (c)
1.	Conduct public meeting: NEI presented the guidance in Appendix D and engaged with NRC staff discussion.	April 28, 2016 (c)
1.	Complete initial review of Appendix D and provide general comments to NEI.	August 2016 (c)
1.	Finalize Draft NEI 96-07 Appendix D, "Definitions" Section	November 2016 (c)
1.	Finalize Draft NEI 96-07 Appendix D, "Introduction" Section	2nd Qtr. CY 2017
1.	Provide formal comments on Draft NEI 96-07 Appendix D, "Screen Guidance" Section	March 17th, 2017 (c)
1.	Finalize Draft NEI 96-07 Appendix D "Screen Guidance"	2nd Qtr. CY 2017
1.	Receive revised Draft NEI 96-07 Appendix D, "Evaluation Guidance" Section for review	February 15, 2017 (c)
1.	Finalize Draft NEI 96-07 Appendix D, Section 4.0, "Evaluation Guidance" Section	2nd Qtr. CY 2017
1.	Finalize Draft NEI 96-07 Appendix D, Section 5.0, "Examples"	2nd Qtr. CY 2017
1.	ACRS Meeting on Draft NEI 96-07 Appendix D	May 17th, 2017
1.	Conduct table top exercise with industry using the revised Appendix D to verify the new guidance is clear and consistent.	3rd Qtr. CY 2017
1.	Decide on appropriateness of issuing interim endorsement letter, and issue letter, if appropriate.	3rd Qtr. CY 2017
1.	Begin update of regulatory guidance.	4th Qtr. CY 2017

NUCLEAR ENERGY INSTITUTE

S. Jason Remer - NEI
Vic Fregonese - NEI
Neil Archambo – Duke
John Connelly – Exelon

May 17, 2017

NEI Update to ACRS on Digital I&C Initiative

Nuclear Plants Are Critical Infrastructure

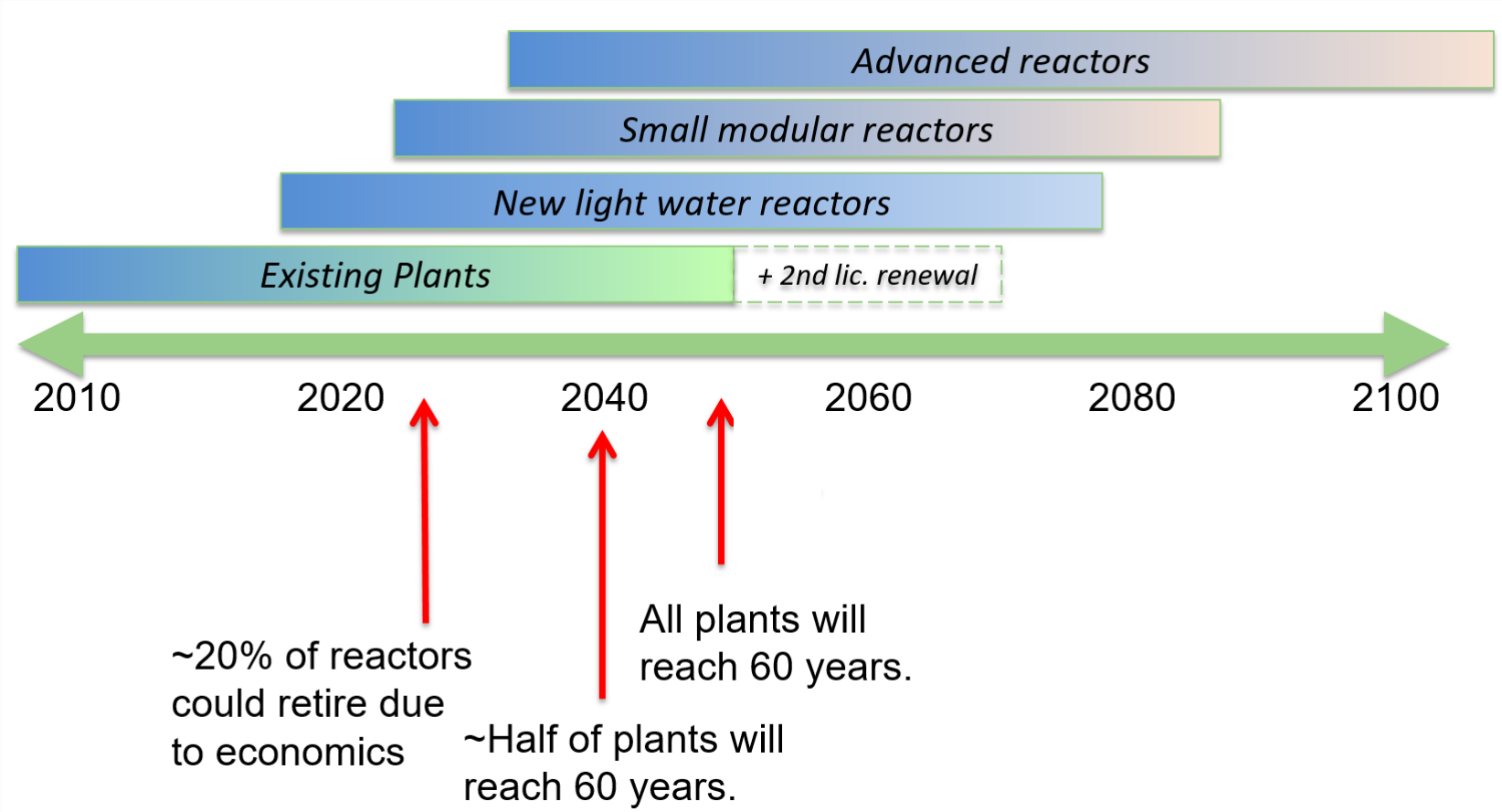
- U.S. has the largest and best-run fleet of nuclear power plants in the world
- Generate 20% of America's electricity overall; 62% of emissions-free electricity
- Like other major infrastructure, nuclear plants provide tremendous benefits for nearly a century
- Nuclear energy needs to be included in any plan to rebuild America

NEI

Major Industry Challenges

- Electricity demand is expected to remain flat or show marginal growth
- Nuclear plant costs increased as electricity markets were deluged with natural gas at historically low prices
- Solar and wind continue to expand, thanks to state, federal policy support
- Flawed electricity markets fail to recognize and value nuclear energy's key attributes
- Nuclear energy's average generating cost peaked at $40 per megawatt-hour in 2012

Defining our Future



The Case for Implementing Digital I&C

- Improve overall nuclear plant **Safety**
- Make improvements to plant **Efficiency**
- Improve long-term **Reliability** of critical I&C systems
- Manage component obsolescence
- Helps support the Business Case for 2nd License Renewal **(>60 Years)**
- **OE** – Industry in the US has been implementing digital upgrades for the past 25 years improving plant safety with significant success driven by plant availability and trip reduction modifications

Critical Actions

- Industry Chief Nuclear Officers commissioned the Digital I&C Working Group to break down barriers to full plant application of digital systems
- NRC Commissioners instructed staff to establish a plan to “modernize the NRC regulatory infrastructure” - NRC Digital I&C Integrated Action Plan (IAP)
- U.S. Nuclear Industry, as led by the Nuclear Energy Institute (NEI), are working with NRC staff to identify key opportunities and develop a plan to resolve digital issues
- This must be a step change and not a minor adjustment to current policy to be successful

Current State of Digital I&C

- Digital Controls upgrades
  - Non-safety systems are being aggressively replaced
  - Turbine controls and feedwater (PWR) / reactor water level controls (BWR) are the most common
  - A few plants have upgraded their entire non-safety control loops on a DCS platform
- Digital Protection Systems upgrades
  - One plant has replaced their reactor protection system, none are currently in-progress
  - One plant has NRC approval, but has put the replacement on hold
- Regulatory guidance - not clear and/or lack of common understanding with industry on certain issues
  - Screening for changes that do not require prior regulatory approval (10 CFR 50.59)
  - Digital Common Cause Failure
  - Clarity for development and review of digital LARs
- Result: Regulatory uncertainty leads to perception of high risk and creates barriers to implementation of safety system digital upgrades

Where We Are Now

- Considerable progress has been made with NRC and the NEI Digital I&C Working Group using the NRC Action Plan as a guide
  - Significant alignment on the need for improved flexibility in regulatory guidance to address Common Cause Failure (NEI 16-16, “Guidance for Addressing Digital Common Cause Failure”)
  - Regulatory Information document (RIS) to address lower risk modifications due to be issued in July
  - Significant progress on approving Supplemental Guidance for evaluating digital changes or modifications for prior NRC approval (NEI 96-07 Appendix D), due for approval later this year.
  - Agreement on the need for new guidance to support NRC review and approval of digital upgrades to plant systems that are submitted for prior approval (LAR), with near term changes due by end of year.

Update on RIS and NEI 16-16

Vic Fregonese - NEI

NEI 16-16 Update

- Industry has been supporting the MP#1 focus areas. A key activity in MP#1 is to develop a systematic approach to assessing vulnerabilities to common cause failure (CCF), and seek NRC endorsement
- The industry and NRC have engaged in dialogue to develop a common understanding of the CCF issue, and the technical, and licensing approaches to demonstrate the adequacy of the industry proposed approach
- NEI submitted early working drafts of NEI 16-16 to the NRC staff and received comments, and feedback during meetings and workshops held in 2016 and 2017
- The goal of these NEI and staff interactions were to support the near term goal of having a clear path established by July, 2017 to enable the final issue of NEI 16-16 by the end of 2017
- The systematic approach provided in NEI 16-16 includes defensive measures from EPRI research (Report #3002005326) to be considered in assessment of CCF vulnerabilities
- NEI recently submitted Draft 2 of NEI 16-16 for NRC review. (May 12, 2017)

RIS Update

- NRC and staff have been engaged in regular interactions on the RIS and Qualitative Assessment Guidance
- NEI submitted comments on early version of the RIS documents on 4/5
- NEI submitted example 50.59 evaluations to support April meetings
- The Updated Draft RIS and Attachment was released and discussed at a Public meeting held on April 20
- NEI submitted comments on the draft RIS on 4/26 to support the FRN release schedule
- NEI and NRC will meet on May 25 to discuss comments, and FRN version of the RIS

Industry Impact Due to Regulatory Uncertainty

Neil Archambo - Duke

Examples Of Digital Upgrades On The Shelf Due To Current Regulatory Uncertainty

- Control Room Chillers
  - Aging analog-based control room chillers are in need of replacement at a number of US nuclear sites
  - Some utilities have procured new chillers with digital controls and have qualified the equipment through the commercial grade dedication process
  - However, due to regulatory uncertainty associated with digital modifications, utilities are reluctant to install the new chillers
  - In some cases, none of the new chillers have been installed; in other cases, only one chiller train has been installed

Examples Of Digital Upgrades On The Shelf Due To Current Regulatory Uncertainty (Cont.)

- EDG Voltage Regulators
  - Analog based EDG controls, such as voltage regulator systems are, for the most part, obsolete
  - The motor-operated potentiometer (MOP) is a component of the EDG voltage regulator system in need of replacement
  - EPRI Report 1011218 states that MOPs are considered the weakest link in any voltage regulating system
  - The EDG voltage regulator manufacturer recommends replacement of the MOP with a digital reference adjuster (DRA)

Examples Of Digital Upgrades On The Shelf Due To Current Regulatory Uncertainty (Cont.)

- EDG Voltage Regulators (Cont.)
  - The DRA is a relatively simple device utilizing only two inputs and a single output, executes only 17 lines of code, and has no moving parts
  - Some utilities have qualified the DRA through the commercial grade dedication process and have completed the associated design change packages for installation
  - However, due to regulatory uncertainty associated with digital modifications, these utilities have opted to maintain use of the analog MOP

Prospective Digital Upgrades With New Regulatory Guidance (New RIS & NEI 16-16)

- Control Room Chillers
- EDG Controls
- EDG Load Sequencers
- Control Room Annunciator Systems
- Essential Bus Protective Relaying
- PAM Recorders/Indicators
- Turbine Driven Auxiliary Feedwater Pump Controls

With today's environment, many see a much lower regulatory risk with continued use of obsolete analog equipment versus installation of new digital equipment – even if all indications are that the new digital equipment is more reliable and could have a positive impact on plant safety.

Industry Impact Due to Regulatory Uncertainty

John Connelly - Exelon

Problem Statement

There are three broad issues with the application of digital technology that are closely related to each other

- The regulatory framework largely precludes the industry from modernizing safety related systems
- Modification processes are inconsistent between peer utilities reducing our ability to share design content and capitalize on available economies of scale
- Organizational structures and processes are not optimized for the technologies we are deploying

The convergence of several industry initiatives affords us a unique opportunity to address these issues in unison. In so doing, we can significantly reduce costs and improve performance

Regulatory Track

- For safety related systems the industry is, for all practical purposes, stranded in the 1970's and constrained to the analog domain
- Equipment obsolescence and declining performance are becoming increasingly urgent issues
- The genesis of this issue can be traced to policies that are nearly 25 years old that have been largely eclipsed by technology

These issues deprive the industry of performance improvements and cost savings opportunities that could be readily achieved in a regulatory environment typical of other high-consequence industries (i.e. aerospace, pharmaceutical and petrochemical)

Progress in resolving these issues is being made under the auspices of the NRC Digital Action Plan and NEI Digital I&C Working Group

Summary

- The regulatory infrastructure for Digital I&C must be modernized to ensure safe and economic long term operation of nuclear fleet
- Current and continuing aggressive efforts under the Digital Action Plan will yield results
- Regulatory barriers to application of modern digital control systems must be removed

Questions?

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RIS 2017-XX: Clarification of NRC Staff Endorsement of NEI 01-01 (Originally Endorsed in RIS 2002-22)

ACRS Subcommittee Meeting

May 17, 2017

David Rahn, Presenter

Discussion Topics

- Need for Clarification of RIS 2002-22
- Evaluation of 2003-2014 Inspection Findings
- Strategy for Issuance of Near-term Clarification
- Scope of Applicability of the Clarification to Support the Successful Performance of 50.59 Evaluations
- Guidance in NEI 01-01 Sections 4, 5, and Appendices A and B
- Arguments for Responding to 50.59 Criteria 1, 2, 5, and 6
- Reducing Uncertainty in Modifications Evaluated via 50.59
- Qualitative Assessment Preparation and Documentation
- Schedule for Issuance

Need for Clarification of RIS 2002-22

- NEI and key stakeholders stated that there is an immediate need for clarified guidance on implementing digital I&C upgrades using the 10 CFR 50.59 evaluation process.
- Issuance of the clarified guidance cannot wait for the resolution of all the issues identified to date in developing NEI 96-07 Appendix D and NEI 16-16.
- The clarified guidance should enable the implementation of easier-to-analyze, less safety-significant digital I&C upgrades and replacements, to address immediate obsolescence issues.
- The staff identified that the quickest regulatory vehicle that could enable such clarified guidance is to issue a clarification to Regulatory Issue Summary 2002-22, which endorsed NEI guidance document NEI 01-01.

Component Design Basis Inspection Findings 2003-2014

- NRC staff have been evaluating inspection findings associated with digital I&C upgrades and replacements performed using the 10 CFR 50.59 evaluation process, from 2003-2014.
- Most findings and non-cited violations associated with digital I&C replacements pertain to inadequate documentation of the technical basis supporting conclusions that no prior staff review is required.
- The bulk of inspection findings were associated with inadequate documentation of the technical bases supporting responses to 10 CFR 50.59 evaluation criteria 50.59 (c)(2)i, ii, v, and vi.

Strategy for Issuance of Near-term Clarification of RIS 2002-22

- The NRC staff focused on the development of clarified guidance for demonstrating there is adequate evidence in the proposed digital I&C upgrade or replacement to justify a "No" response to each of these 4 of the 8 evaluation criteria:
  - Is there more than a minimal increase in the frequency of occurrence of an accident previously evaluated?
  - Is there more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety previously evaluated?
  - Does the change create a possibility for an accident of a different type than any previously evaluated? and
  - Does the change create a possibility for a malfunction of an SSC important to safety with a different result than previously evaluated?
- Dedicated team of NRC staff members focusing on this effort.
- Limit the Scope of Applicability to proposed upgrades meeting key characteristics criteria.

Scope of Applicability of the Clarification

For the proposed digital upgrades to have a high success at addressing these 50.59 evaluation criteria, the staff proposes to focus the scope of modifications to be covered in the Draft RIS to include the following:

- The proposed change would not compromise any existing design basis independence or diversity;
- The proposed change would not introduce a potential for the types of new failures that would be required to be considered *within* the design basis (e.g., the upgrade does not make use of shared resources, to minimize the potential for cascading failures);
- The proposed change can be shown to have a likelihood of a design defect that would be considered to be significantly lower than that of single failures already considered in the design basis;
- The effects of postulated triggering of any residual low likelihood defects (if any) associated with the proposed change can be shown to be capable of being tolerated by the system-level design or being bounded within the design basis analysis results.

Guidance in NEI 01-01 Sections 4, 5, and Appendices A and B

- NEI 01-01 Sections 4, 5, and Appendices A and B currently provide evaluation design criteria that leads the designer to consider multiple deterministic and qualitative factors while developing qualitative assessment arguments that would demonstrate the introduction of a new digital technology-related defect would have a low likelihood of occurrence.
- However, this guidance does not specify a method for clearly organizing, performing, and documenting an adequate technical basis for responding to the 50.59 evaluation questions.
- Also, the staff's previous endorsement of NEI 01-01 in RIS 2002-22 did not provide any augmented guidance or take exceptions to Sections 4, 5, Appendix A or B, for preparing such qualitative assessments when addressing 10CFR50.59.

Arguments for Responding to 50.59 Evaluation Questions

The key arguments that can be made to justify a "No" response to 50.59 evaluation questions (c)(2) i, ii, v, and vi, are based on:

- demonstrating the frequency of accidents and malfunctions is not increased because the likelihood of introducing a new failure is low, since the proposed new design has characteristics enabling the upgrade to be more reliable/dependable than the equipment it is replacing, and adequate quality measures, such as design control, configuration management, validation and verification processes, etc. have been applied to provide additional assurance that new failures are unlikely to occur.
- demonstrating the potential for accidents of a new type is very low because, if designed correctly, it would require a sequence of unlikely events to occur before the accident is even possible.
- demonstrating that any potential residual low likelihood defects can be shown to be tolerated by the plant and its effects are still bounded within the existing design basis analyses results.

Methods for Reducing Uncertainty in Modifications Evaluated under 50.59

- The proposed design does not make use of shared resources.
- The proposed design does not combine functions not previously combined.
- The proposed design does not include digital links or networking to communicate with systems accomplishing other plant design functions.
- The proposed design does not reduce any independence credited within the existing design basis.
- The proposed design has attributes demonstrating a high degree of dependability.
- The resulting system-level design makes use of multiple layers of internal and external defense.
- The proposed design was executed using effective quality measures to minimize the likelihood of introducing errors.
- The components proposed for use have significant operating experience in similar environments, conditions, and service duties.

Qualitative Assessment Preparation and Documentation

- Document the evaluation of the modes and consequences of potential failures associated with the proposed design, and compare them against those of the previous design. Demonstrate how the design attributes and quality measures applied serve to reduce uncertainty in safety performance.
- The selection of the design standards (or portions thereof) to be employed should be commensurate with the level of safety significance of the modified component or system, and the possible safety consequences that may result from its failure.

Qualitative Assessment Preparation and Documentation

- Evidence should be presented regarding how the design attributes, quality measures, and operating experience of the equipment and software tools combine to demonstrate a significant reduction in the likelihood of introducing potential new defects, and that the effects of any residual failures or defects can be tolerated by the design or be bounded within the existing plant safety analysis results.

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Schedule for MP #1A—RIS 2017-XX

Guidance for preparing and documenting qualitative assessments in support of 10 CFR 50.59 evaluations of proposed digital I&C modifications

	Activity	Schedule
A.1	Prepare preliminary drafts of RIS 2017-XX, clarifying the staff's previous endorsement of NEI 01-01	March 2017 (complete)
A.2	Share preliminary drafts with NEI/Stakeholders/Public ADAMS ahead of 1st public meeting held March 30, 2017	March 28, 2017 (complete)
A.3	Discuss proposed NRC strategy and concepts with NEI/industry stakeholders at public meeting	March 30, 2017 (complete)
A.4	Issue subsequent drafts of RIS in support of next public working-level meeting	April 5-18, 2017 (Complete)
A.5	Hold second public working-level meeting to discuss NEI/industry stakeholder input for consideration	April 20, 2017 (complete)
A.6	Address NEI/industry stakeholder input for consideration, resolve NRC staff internal comments	April 21-May 16, 2017 (complete)
A.7	Brief ACRS on Rationale for Staff's Revised Endorsement of NEI 01-01	May 17, 2017 (today)
A.8	FRN to issue RIS	May 19, 2017
A.9	30-day Formal Public Comment Period	May 20 – June 19, 2017
A.10	Hold Public Workshop applying clarified RIS guidance, Discuss Early Public Comments,	May 25, 2017
A.11	Resolve Public and Stakeholder Comments, resolve NRC staff concurrence comments, OGC, CRGR, ADM	June 20-July 15, 2017
A.12	Issue RIS for Use	Target: July 2017