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UNITED STATES NUCLEAR REGULATORY COMMISSION  
BRIEFING ON DIGITAL INSTRUMENTATION AND CONTROL

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THURSDAY

June 4, 2009

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The Commission convened at 9:30 a.m., the Honorable Gregory B. Jaczko,  
Chairman presiding.

NUCLEAR REGULATORY COMMISSION

GREGORY B. JACZKO, CHAIRMAN

PETER B. LYONS, COMMISSIONER

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1 INDUSTRY PANEL

2           ALEX MARION, Vice President, Nuclear Operations, Nuclear Energy  
3 Institute (NEI)

4           RON JONES, Senior Vice President, Nuclear Operation, Duke Energy  
5 Corporation

6           TERRY GARRETT, Vice President Engineering, Wolf Creek Nuclear  
7 Operating Corporation

8

9 NRC STAFF PANEL

10           WILLIAM BORCHARDT, Executive Director for Operations (EDO)

11           JACK GROBE, Associate Director for Engineering and Safety Systems,  
12 NRR

13           ANNE BOLAND, Acting Director, Division of Engineering, NRR

14           IAN JUNG, Chief Instrumentation, Controls and Electrical Engineering  
15 Branch 2, Division of Engineering, NRO

16           MARISSA BAILEY, Deputy Director, Division of Fuel Cycle Safety and  
17 Safeguards, NMSS

18           STUART RICHARDS, Deputy Director, Division of Engineering, RES

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

2 Chairman Jaczko: Good morning. This is an annual meeting on digital  
3 instrumentation and control. This morning we will hear first from a panel of  
4 stakeholders and then following that, the staff will make some presentations. And  
5 I think I have seen this issue evolve over the last couple of years. We've made  
6 certainly significant progress. Most recently, I think culminating in the approval for  
7 Wolf Creek of the field programmable gate array digital instrumentation system or  
8 the digital components which I think was certainly an important step in moving  
9 forward. As an agency as we look at these issues and as an industry, it is  
10 certainly important to be able to deal with digital instrumentation and control  
11 because these systems really have a potential to bring about tremendous safety  
12 and performance improvements that I think are necessary, and with obsolescence  
13 will become vital as we go forward in the future but of course, it is important as the  
14 NRC does it review that we make sure the systems can be designed and  
15 developed and tested in a way that we can ensure our safety responsibilities can  
16 be met. So there has been a tremendous amount of progress over the years. I  
17 certainly would want to recognize Commissioner Lyons for his leadership role in a  
18 lot of these issues. He's focused the NRC on addressing these issues whether it's  
19 in cyber security or how we handle the simulators and what the right approach is  
20 for the NRC to be prepared to deal with our own review of digital systems. I want  
21 to recognize his leadership and he will be leading the questioning today. So with  
22 that, are there any comments from my fellow Commissioners? Thank you.

1           MR. MARION: Good morning Chairman Jaczko, Commissioner Klein,  
2 Commissioner Lyons and Commissioner Svinicki. It is a pleasure to be here this  
3 morning to offer industry perspectives on the application of digital control  
4 technology and instrumentation control systems at nuclear power plants.

5           May I have the next slide please. These are the topics that I intend  
6 to provide a brief overview of. Next slide please. In terms of objectives, these are  
7 the same objectives that we stated at prior briefings of the Commission and they  
8 remain valid today. Essentially we are looking for a digital licensing process that is  
9 stable, predictable and timely. We believe guidance is necessary for the licensing  
10 process that is understandable and usable. And we believe if we accomplish the  
11 first two, that we can facilitate the application of digital technology that enhances  
12 plant safety, availability and reliability. Next slide please.

13           In terms of progress to date, the project plan has been implemented  
14 successfully and by that, I mean in effect is an effective tool for managing such a  
15 complex project, provides a structured and disciplined approach with clear  
16 accountability of deliverables and milestones. We spend a lot of time with the  
17 NRC on many, many issues spending a lot of resources in defining problem  
18 statements. In this project, that has been a very efficient and effective process  
19 and we're pleased with the progress to date. Interim staff guidance has been  
20 finalized on cyber security, PRA, communications and human factors.

21           Next slide please. One ISG or interim staff guidance is currently being  
22 revised and that involves diversity and defense in depth. Two staff guidance

1 documents are currently in development. The licensing process and fuel cycle  
2 facilities. We just received Revision 2 to the project plan yesterday and I have not  
3 had an opportunity to thoroughly review it in terms of the status so I don't know if  
4 the project plan comports with what I say here because this was provided to you a  
5 week ago. But our intent is to continue interacting with the NRC staff, to identify  
6 and resolve issues in a transparent and collaborative manner. Next slide please.  
7 The remaining efforts; we really believe that it is crucial that the interim staff  
8 guidance associated with the licensing process be vetted and be completed.

9           There are other activities or other areas that have been raised relative to  
10 operational issues, research and incorporating operating experience. We believe  
11 they can be pursued outside the project plan framework.

12           Next slide please: We do have continuing concerns. We remain concerned  
13 about the extraordinary level of detail for the license amendment process. It is  
14 unprecedented. As we indicated in prior Commission briefings the staff review is  
15 similar to an independent design review as opposed to documenting a finding of  
16 reasonable assurance. Minimal credit is given for existing Appendix B programs.  
17 These are programs imposed by the licensee upon the vendor in a procurement  
18 contract and specifications; and also imposed by the vendor during the design  
19 manufacturing and inspection and testing activities. This level of detail has  
20 presented an undue burden upon the two applicants. And I firmly believe they  
21 present a disincentive for future applications.

22           This area is critically important and fundamental to achieving the objectives

1 I identified earlier. And I believe those objectives continue to be shared by the  
2 NRC and all stakeholders. So this is extremely important to resolve this particular  
3 area in terms of this staff guidance.

4 Next slide. In terms of requested activities going forward, we believe that  
5 the licensing process needs to be resolved. We have a few issues. We are in the  
6 process right now of reviewing drafts of that guidance and hope we can get to a  
7 point where we do have a predictable stable licensing process going forward.

8 We fundamentally believe and we are requesting the Commission consider  
9 a change in the policy on diversity defense in depth. And I'm referring to the Staff  
10 Requirements Memorandum that was issued on SECY paper 93-087 which is  
11 relatively silent on the use of risk information decision-making. We think a policy  
12 change is necessary to fully enable the licensing of digital I&C designs by allowing  
13 risk informed methods.

14 Next slide please. We believe that this effort in terms of the project plan  
15 should continue until the regulatory guidance documents are completed this year.  
16 I understand there may be a couple of guidance documents that will be completed  
17 in early 2010. But we believe that the steering committee should be maintained  
18 through 2010 to provide continuing oversight and coordination until these issues  
19 are completed.

20 We will work with the industry to identify addition pilot plants. We have  
21 efforts underway between EPRI and the Office of Research under a Memorandum  
22 of Understanding to investigate a number of areas relative to new methods and

1 additional research. For example, one of the items is more data collection on  
2 operating experience for digital systems and we will continue to support those  
3 efforts. We request a Commission briefing by the end of 2009.

4 That completes my presentation. I will be more than happy to answer any  
5 questions now or following the subsequent presentations by the two  
6 representatives from industry.

7 Chairman Jaczko. Mr. Jones?

8 Good morning, My name is Ron Jones. I'm Senior Vice President of  
9 Nuclear Operations for the Duke Energy Fleet. I was part of the Commission  
10 briefing about a year ago and I'm happy to be here again with you today to bring  
11 you an update on the Oconee RPS ESPS project. First, I want to express my  
12 appreciation for the continuing efforts of the NRC and NEI to address critical  
13 issues of digital instrumentation . We have come a long way. The work has been  
14 well worth it.

15 Next slide. Terminology, the system we are talking about is RPS, ESPS  
16 which is the Reactive Protection System and Engineered Safeguards Protective  
17 System for the Oconee Nuclear Site..

18 Next slide. We are replacing this legacy analogue system with digital  
19 technology using the AREVA TELEPERM XS platform, we think it is appropriate to  
20 address future obsolescence issues by modernizing our I&C systems. We believe  
21 these systems offer significant improvement in nuclear safety, reliability and safety  
22 system availability. Furthermore, we believe digital is the foremost enabling

1 technology for future improvements in plant operations. Based on our  
2 understanding of the progress of the NRC in reviewing this submittal, we anticipate  
3 regulatory approval in the fall of this year. We appreciate the NRC working  
4 diligently to this end.

5         Regarding the schedule, we have had to defer the implementation for the  
6 first Oconee unit from the fall of this year to the spring of 2011 due to re-evaluation  
7 of time needed to ensure thorough implementation planning once the submittal is  
8 approved.

9         Next slide, please. As you know, the Oconee review was conducted in  
10 parallel with the staff development of the proposed digital licensing process  
11 guidance with many of the Oconee review elements incorporated. Some of the  
12 other interim staff guidance has been helpful in resolving certain issues in the  
13 submittal, specifically in the areas of communications and cyber security. Again,  
14 we appreciate the efforts by both NRC and NEI to help develop these workable  
15 solutions for those issues. I want to especially recognize the significant effort of  
16 NRC in conducting the review of the submittal in a professional and productive  
17 manner.

18         I would specifically mention the dedicated work of the I&C branch and our  
19 project managers. When this effort is complete, I believe it will be a major  
20 accomplishment for our respective organizations in working cooperatively to gain  
21 approval for implementation of such a safety significant digital system.

22         We're also very much aware of the industry interest in this submittals of the

1 demonstration of the digital licensing process. We were happy to share our  
2 experience at the recent NRC sponsored workshop on this topic.

3         Next slide. On licensing process guidance, we do appreciate the work done  
4 there and we agree with proposed multi tier review structure that can take  
5 advantage of previous approvals and implementations. We recognize that  
6 Oconee was a first of a kind review and I want to make it clear that our remaining  
7 concerns with the licensing process are in regard to the potential effect on future  
8 digital upgrades and not directed to the current Oconee review.

9         The first concern is the amount of documentation required to be placed on  
10 the docket. In our case, it was over 140 documents representing over 27  
11 thousand pages of information. We would encourage NRC to provide alternate  
12 means to the licensee to provide access to this level of documentation.

13         The second concern is not receiving regulatory approval until after the fact  
14 acceptance test. Because the system is fully built at the time of the factory  
15 acceptance test, most of the project costs will be committed without sufficient  
16 confidence that the submittal will be approved.

17         For example, with the Oconee approval still pending, our investment to date  
18 exceeds \$100 million dollars. Although today we have greater confidence that we  
19 will receive approval, over the course of the Oconee project, the rates of  
20 investment was continually out of balance with the degree of uncertainty in the  
21 final cost in schedule or even the ultimate approval.

22         Next slide. I mentioned at the beginning that we believe digital technology

1 has enormous potential to improve nuclear safety and plant operation. To that  
2 end, the Oconee submittal is an important first step in defining the licensing  
3 process that enables the much needed upgrading of the legacy I&C systems  
4 across the operating fleets.

5 Further, we believe it is in the mutual interest of the NRC and the industry to  
6 work together to refine the licensing process, such that we can satisfy all safety  
7 and regulatory requirements. And at the same time, further reduce the risk and  
8 burden in managing these large projects. It would be unfortunate if licensees  
9 decided to forego opportunities to improve nuclear safety through digital upgrades,  
10 not because they lack confidence in the technology, but because they determine  
11 that the risks and burden for pursuing a license amendment were too high.

12 However, we believe there are available solutions to these issues that  
13 preserve everyone's interests and outcomes. We would welcome the opportunity  
14 to continue to work together to refine this process. Thank you.

15 Chairman Jaczko: We'll now hear from Terry Garrett.

16 MR. GARRETT: Thank you. My name is Terry Garrett, Vice President of  
17 Engineering for Wolf Creek Nuclear Operating Corporation. We operate the Wolf  
18 Creek generating station, Burlington, Kansas. On behalf of Wolf Creek and the  
19 owners, I thank you for the opportunity to discuss Wolf Creek's experience with our  
20 digital safety-related I&C application.

21 Wolf Creek received NRC approval at the end of March of this year and we  
22 will install the application of our safety-related main steam and main feedwater

1 isolation valve controls in our fall refueling outage this year.

2           Next slide. Our objectives were straightforward when we began this project  
3 and typical for many of our equipment reliability and equipment upgrades typical  
4 for a nuclear station. We wanted to improve the equipment reliability while  
5 improving the nuclear safety of the station. We want to address equipment  
6 obsolescence issues and also we wanted to gain NRC approval in a fashion that  
7 we could have minimal review going forward for our next application using the  
8 same platform and design.

9           Next slide: So our approach started off with, we decided we wanted to  
10 have a common platform that we would then apply to all future safety related I&C  
11 applications. We wanted design simplicity, by that I mean the design is simply.  
12 It's using a hardware logic-based structure. We believe it's a best fit for our station  
13 for the safety actuation systems and it retains as much of the existing I&C  
14 structure and architecture as possible.

15           It also incorporates advanced testing and diagnostics like continual testing  
16 while on-line.

17           Next slide: Also, we wanted to avoid any additional diverse actuation  
18 systems. Some of the benefits then we have achieved, we have begun already  
19 our next application using this same design and platform. And we believe this next  
20 application of this platform will require minimal NRC review. By that, we believe  
21 we would be able to use the 10 CFR 50.59 process but again, we have not  
22 actually begun that work and tested that part of it yet, which we believe if we can,

1 will be a huge benefit for us going forward in terms of the resources required for  
2 both our staff and your staff.

3 Also, the equipment reliability is one of the key aspects of a safety critical  
4 control system and the ALS system, Advanced Logic System, which is the term  
5 the vendors has given this, incorporates several characteristics that achieve a  
6 high-level of reliability. Obsolescence has been resolved and finally and most  
7 important with the elimination of several single point vulnerabilities in the system,  
8 existing system, and the improved testing diagnostics, we've increased the  
9 integrity and reliability and with that improved the overall nuclear safety of the  
10 station.

11 Next slide: Let me end with some of our experiences going through the  
12 licensing process. The license review process was challenging, but we are  
13 extremely grateful that it was approved. We had outstanding interaction with the  
14 NRC staff as we went through this process. But it was a strain on our resources  
15 and I'm sure it was a strain on NRC's resources and it was much more than we  
16 had anticipated going into this. I'd attribute some of the challenge also to the fact  
17 that this application review process was somewhat first of a kind. And the process  
18 was really not clear to us and I believe not even to the staff because as you will  
19 note, many of the interim staff guidance had not been issued yet when we began  
20 this.

21 And as I mentioned, it was a first time application of this Advanced Logic  
22 System which uses a field programmable gate array based platform. And as I

1 mentioned, the key interim staff guidance was actually not issued until we were  
2 well into the review, design and review.

3         Having said that, however, the documentation in-depth review was more  
4 than we had ever experienced before. Detailed design information was requested  
5 above what we had experienced. For example, the power and reset design of  
6 boards which is a simple analogue component design concept was something that  
7 was reviewed in detail. We had not anticipated that.

8         The detailed information is much greater than we were required. We  
9 submitted over 7,000 pages of documentation and not typical of what we would  
10 see for an analogue system or microprocessor system. Even resumes were  
11 submitted on the vendor design team as part of the review which again was my  
12 point, went above and beyond what we would normally expect to see. It kind of  
13 comes down in my opinion that we have gone as Alex mentioned maybe beyond  
14 reasonable assurance and more into the independent design process.

15         Another example is for a hardware based system, we wanted to use  
16 testability as a means to demonstrate its function before we finish the design as  
17 part of that process, and we felt that would provide reasonable design assurance.

18         We decided as we got into this since it was unclear to us, that testability  
19 would be a successful way to go, that we dropped that and went to basically to a  
20 diverse function within the field programmable gate array itself.

21         Finally, lastly, the use of ISGs 1, 2 and 4 were very beneficial and helped us  
22 and had they been in place prior to, I think they would have help reduce the

1 amount of review and the amount of uncertainty we had going into this. Thank  
2 you.

3 CHAIRMAN JACZKO: Thank you for those presentations. I'll turn to  
4 Commissioner Lyons for questions.

5 COMMISSIONER LYONS: I thank you for comments and I think your  
6 comments indicate what I think we all are well aware of. This has been a learning  
7 process, a learning process for industry and a learning process for the staff.  
8 Although the process as you outlined, it was perhaps painful at times, I do think  
9 the progress is extremely impressive given where we were as an agency and an  
10 industry some years ago. I think to come this close to the final approval on Wolf  
11 Creek and looking very positively on Oconee, I think just speaks very, very well for  
12 the activities both of staff and industry. And I certainly thank you for your  
13 participation in that.

14 Our Chairman in his opening comments referenced the safety benefits  
15 which I too feel very, very strongly will accrue from the transition to additional use  
16 of digital systems.

17 At the same time, I've been convinced all along that the use of digital  
18 systems does open new failure modes that need to be understood and mitigated if  
19 they need mitigation. So, it certainly has been a challenge but, I would agree  
20 Terry, I think you said it very well in describing some of the benefits that should  
21 accrue from this and moving away from the obsolescence of the analogue based  
22 systems. Certainly, it is my hope that all of this progress translates to further

1 applications and Alex, you mentioned interest in additional pilots.

2 From my perspective, I very much hope industry would identify additional  
3 pilots and continue to work with the staff as we refine this process. Now,  
4 throughout I think all of your presentations were concerns over the burden of these  
5 first time applications. And to some extent, I guess I think that's unavoidable on  
6 everybody's part. It is new and we do need to address new uncertainties and new  
7 challenges. But I wonder if any of you would like to address as you look ahead to  
8 additional pilots, how much of the burden that you folks felt would need to be --  
9 would need to be shared again with subsequent applicants?

10 I would hope that the ground that Oconee and Wolf Creek have plowed will  
11 lead to substantial simplification for whoever follows in your footsteps with  
12 additional pilots. And I'll ask staff the same question when they are here too. But  
13 I'm just curious if any of you can speak to how you might see the burden reduced  
14 to the extent that it is possible to build off your knowledge, and I would hope build  
15 in some sort of standardized way, off the progress that you have made. But could  
16 any of you comment on that?

17 MR. JONES: I would be glad to. I think that you summarized it correctly  
18 that with the first of a kind, whether its digital or anything else we try to do at  
19 nuclear plants, there's going to be some learning that occurs on both sides. And  
20 with digital, safety related digital project, we certainly learned a lot at Duke. There  
21 are things that we would certainly do different on a future submittal as far as more  
22 upfront communication, discussion on philosophy, that sort of thing. The other

1 things that are different, of course, are the hard lessons learned that have now  
2 been put into procedure and process. That's available for future applicants. The  
3 biggest concern though that I have from a business perspective is any time we  
4 make an investment in our plant we are hoping to reap something out of that.  
5 Sometimes we make investments purely for nuclear safety has nothing to do with  
6 megawatts. Sometimes we invest for megawatts. On a nuclear safety one like  
7 this, we feel very strongly as I think you do that it certainly enhances nuclear  
8 safety. It makes the operator's job much clearer. The operator now has a system  
9 that not only tells them when something fails it warns them before something fails.

10 From a business perspective, we have to have certainty that our investment  
11 will be realized. And when we get into anything nuclear it costs a bit of money.  
12 When we get into digital systems, it cost even more. I think the biggest roadblock  
13 that we see for future applications is recognizing and getting assurance that  
14 investment is going to be put to use and not get somewhere down the road and  
15 find out that there is a problem and what you have invested is now lost.

16 That ties with the other concern which is the amount of documentation. It  
17 centers back on how much needs to be done on the front end as part of the  
18 licensing review of the submittal. There are certainly lots of stuff that's being done  
19 on the utility's part, the vendor's part with respect to design, design review, that  
20 sort of thing. There is some portion that the NRC does need to look at. The  
21 question is how much is enough and in essence assuring that the amendment is  
22 going to go through and how much can be done once the amendment is through

1 and the utility is in the process of final design, build, testing that sort of thing. So I  
2 think that's the problem right now where the break point is when assurance is  
3 given.

4 COMMISSIONER LYONS: Terry or Alex?

5 MR. GARRETT: Yes, I would echo a lot of what Ron just talked in. But,  
6 first of all, we are extremely grateful and glad and pleased that we got approval  
7 because there are a tremendous number of benefits from this. And we had strong  
8 needs, the obsolescence issues, the increasing unreliability of the existing  
9 systems. We are getting at the point where we were concerned going forward. So  
10 we had a strong need. But again, from a business point of view, what I would say,  
11 we are probably somewhat naive. We looked at our particular application which is  
12 a hardware, non-CPU, non-software system. We looked at that and this should be  
13 simple to license and get approved.

14 But from a business point of view, next time I would have wanted my  
15 engineers to give me more certainty of the time involved, the efforts involved. And  
16 what we found as we went through this, it became, more effort, more resources. It  
17 was -- maybe this is a bad analogy -- like swimming across the English Channel,  
18 we had gotten about half way and decided to go back was going to be as costly as  
19 going forward so we were going to keep moving forward to get approval. We had  
20 a strong belief this was a good system to go with.

21 So, my concern if I had to do this over is would I start again? I'm not certain  
22 I got that certainty yet in the licensing process. I want to know that upfront. But

1 now, having said that, I believe the groundwork for this particular application, the  
2 next application should be much more straightforward both from what the licensee  
3 would need to have ready and designed and reviewed, thought about and also  
4 from the staff's review, I think they learned a lot too.

5 COMMISSIONER LYONS: Terry, the way you described it is very much  
6 what I am hoping. So we all regret the burden that was on both you and staff this  
7 time around. But, certainly, my question was hoping that a lot of learning that you  
8 folks accomplished as is transmitted to other applications to other pilots, that there  
9 will be a smoother path. And you can probably make all kinds of analogues to  
10 explorers of the past but continuing with your swimming of the English Channel but  
11 the fact that you folks did start out on a quest and did reach the other side of the  
12 channel, I think should give you a great deal of hope and confidence to those who  
13 follow you. I'll stop there unless Alex you want to comment.

14 MR. MARION: If I may take a few moments and add a couple of thoughts.  
15 It seems to me we are at a point where we all acknowledge this is a first of a kind  
16 application and there is a learning process from everyone involved on that  
17 application. Now that we have gone through it, the question is what is the balance  
18 going forward? What balance do you strike between establishing and  
19 documenting confidence in the system, and establishing a licensing process that  
20 includes some material that will be submitted with the application and then,  
21 allowing other material to be verified during inspections and audits going forward.  
22 I think that's the balance that will give us a success path going forward over the

1 longer term.

2 COMMISSIONER LYONS: I'm out of time, so thank you.

3 CHAIRMAN JACZKO: Maybe we can continue in some of these areas.

4 Alex, one of the points that you made is the interest in risk-informing the digital  
5 safety decision-making process. And I think that is an interesting area, it's one we  
6 touched on in past meetings. And ironically, today, we have ACRS in the  
7 afternoon and digital has been an important issue for ACRS and they commented  
8 a lot on it. And one of their most recent letters I think one of the things -- and I  
9 think the staff has also come to the same place which is namely, that right now,  
10 we don't have the state-of-the-art and really the ability to do the risk-informing in  
11 the digital systems. That seems to be the conclusion from ACRS, from the staff.  
12 What's your sense of that? I guess I hear a different answer.

13 MR. MARION: At this point in time, I think that's where we are. At least I  
14 understand there is general agreement between the Office of Research and EPRI,  
15 Electric Power Research Institute, to move forward and try to develop some  
16 risk-informed methods that can be developed in near term to give us better  
17 insights on the risk impacts on some of these systems. Fundamentally, as you  
18 think about it from the standpoint of instrumentation and control systems, the  
19 inputs are the same and the outputs are the same. The question is the process  
20 used internally, one you can really see and analysis, and the other is a black box,  
21 if you will, for lack of a better term. The question is how much of the black box is  
22 necessary to model and understand completely? And that's the question.

1 I think everything outside the box can be adequately modeled but that's the  
2 work that EPRI and the NRC Office of Research will be concentrating on.  
3 Whether they come up with methods that are practical and usable remains to be  
4 seen, but there is an agreement that needs to be done.

5 CHAIRMAN JACZKO: I appreciate that and perhaps less confident that that  
6 is something we will be able to get to in the short term. I'm a little more skeptical  
7 that we will in the end be able to come up with these kinds of methods in the short  
8 term, but there is activity in that regard. The other and I hate to stick with the  
9 ACRS theme a little bit, but again, an interesting approach. Really in the short  
10 term, we don't have risk-informed approaches to rely on, we have to rely on  
11 deterministic approaches. It seems that where ACRS is as well in this area is that  
12 they seem to be leaning towards the direction of more design information, not less  
13 is really what we need in order to do the kind of reviews that are necessary.

14 So, getting the complete designs and all those kind of things, maybe you  
15 can touch a little more on why you think the staff should be kind of making these  
16 decisions before they have complete design information, before they have some of  
17 the design details that I think are necessary.

18 MR. MARION: Fundamentally, I don't think it is the NRC's responsibility to  
19 do a design review. As a electrical design engineer although I have not practiced  
20 in a number of years, we had -- essentially, the basic concept is to articulate the  
21 design principles of whatever it is you are submitting to the NRC and how those  
22 design features comport with the regulations or standards as the case may be.

1           And then, identify the documents that will demonstrate that that design has  
2           been executed effectively. And so, if I can draw an analogy, look at the final safety  
3           analysis report, that gives you a general overview. All the supporting documents  
4           in terms of schematic wiring diagrams and maintenance records, etc, are available  
5           on site for inspection. To capture all that information and submit it to the staff I  
6           think basically is not necessary, as a personal point of view.

7           But one would think the thousands pages of documents that have been  
8           submitted in these two examples is not clear to me that the staff has actually  
9           reviewed every page. So I ask the question, what is the practicality of what we are  
10          trying to do here. It gets back to point I made earlier of striking that balance.  
11          That's where we have to focus on going forward.

12          CHAIRMAN JACZKO: I certainly appreciate your thoughts. The staff is all  
13          behind you – a follow-up I guess, and I always like to remind people in all of these  
14          issues, I have never reviewed -- never done a safety evaluation report, never done  
15          a license amendment so my knowledge is somewhat limited in how those go  
16          forward. I guess my naive assumption is that certainly with other systems, non-  
17          digital system, we do some level of design review.

18          I will probably give staff a heads up I will probably be asking that question  
19          as we go forward how this is comparable to what we could do it other areas,  
20          whether it is a pump or valve, containment system, whatever, what comparable  
21          level we have of design review there.

22          Another issue I thought if I could touch on and I think this was something

1 Alex you and I had talked about at last year's meeting perhaps, at that time, we  
2 had an exchange and talked about an incident at Honeywell and one of the things  
3 you mentioned was that industry was putting together a list of I think 300 or so  
4 events working with EPRI cataloging events, digital events where there had been  
5 issues. Of course, if any one wants to answer, feel free. I'm wondering if that  
6 initiative is completed? I think at the time you suggested it was the end of May for  
7 something like that and if that's been done and what you found? If it is, what you  
8 found.

9 MR. MARION: It was completed last year and the report was submitted to  
10 both NRC staff as well as to the ACRS and it captured our understanding of safety  
11 related digital I&C failures. And we could not correlate the experience data to  
12 some of the concerns that the NRC had at that particular time. That's why we  
13 decided that maybe we need to spend more time doing a review of this operating  
14 experience what we have captured as well as the operating experience that's  
15 going to be developed by the two applicants, and reach an understanding of  
16 what's important, what data needs to be collected and should they collect it going  
17 forward.

18 The staff would not accept our arguments that we provided based upon the  
19 operating experience to date and they had their reasons for that. But it is not a  
20 robust database when you really think about it compared to some of the other  
21 databases that we rely on.

22 CHAIRMAN JACZKO: Is it your intention to maintain it?

1 MR. MARION: There are discussions going forward on maintaining it  
2 because we expect that the technology will continue to be applied in the future and  
3 we need to start developing a robust operating experience database.

4 CHAIRMAN JACZKO: It seems to be a useful document. One of the issues  
5 that seems to come up quite extensively in these areas is an understanding of  
6 failure mechanisms and failure modes. Having that database I'm sure is  
7 something I would expect will be incorporated into our operating experience too, if  
8 not already and keep looking for those kinds of things and share information as we  
9 do. And I suspect probably, I don't know if INPO works in that particular area as  
10 well, but I suspect that they do.

11 MR. MARION: We haven't defined it. My objective is to provide some  
12 focused role for INPO as part of this going forward.

13 CHAIRMAN JACZKO: Certainly from my perspective, it would be useful  
14 and I'm sure it will be part of our operating experience program. So thank you.  
15 Commissioner Svinicki?

16 COMMISSIONER SVINICKI: Sorry, I wasn't ready. I thank you for your  
17 presentations and Mr. Jones and Mr. Garrett, I shouldn't admit the things I say  
18 privately but I know we, NRC, frequently uses the approach of pilots and seeks  
19 volunteers. And my question about that, at least I have asked a few times in the  
20 privacy of my office, is why does anybody volunteer? I appreciate that you have  
21 been so candid about your experiences. I think we have had some good  
22 exchange or presentations. They are very thoughtful and maybe I will share a

1 couple of perspectives.

2 One is that I doubt there is anyone within the sound of my voice that would  
3 say 30 years from now, you are not going to walk into any of the current fleet of  
4 operating reactors and find a tremendous number of these systems. What I'm  
5 surprised by is when we fall into the habit of using conditional language about this  
6 like if we can develop the right processes for these reviews. I'd be tempted to say  
7 digital is the future but I mean it is so the now, and 20 years ago. So, we will  
8 resolve these problems and work through these uncertainties.

9 So I appreciate your willingness to be first out of the gate and to try and I  
10 think it is great for us that we had pilots that were so different so that we were able  
11 to have the perspective of the two very different license amendment requests.

12 I think we do have a lot of learning. One thing that Commissioner Lyons  
13 has explored this issue of burden and I agree that it is unavoidable on first of a  
14 kind but it should sure a heck should be a little bit avoidable on a 10<sup>th</sup> of a kind or  
15 20<sup>th</sup> of a kind. My sense is that the NRC staff is very, very committed to the fact  
16 that this will be an evolving process.

17 And the challenge of course for licensees is that they do their amendment  
18 and then move through the process. So I hope you'll have the same benefits. If  
19 you have multiple units, you will have the opportunity to apply the experiences that  
20 you learned in the first go round to additional amendment requests that you might  
21 have and staff will certainly have a consistent involvement so they can be applying  
22 and taking the lessons learned.

1           At the risk of -- I don't mean to make you feel bad Mr. Garrett, but people's  
2 specific word choices often reveal things maybe more than we want it to reveal.

3           So it strikes at my heart and it does not have so much to do with what he  
4 said but you repeatedly, used the term "gratitude." And that should strike at the  
5 heart of any regulator to hear a licensee characterize the regulatory outcome as  
6 something -- to my mind this is not a matter -- should not be a matter of our  
7 benevolence and your gratitude. So I think what concerns me about that and I'm  
8 not sure you meant it that way, but, we need to be careful that what that term says  
9 to me is when I'm grateful for something, it wasn't a matter of the fact that I had  
10 great confidence that I put forth the safety case and it was reviewed on the merits.

11           It indicates there was something that gave discomfort that was arbitrary or  
12 there was great uncertainty in this process.

13           So that is something that we need to reflect on and say as we move  
14 forward, that do these reviews have the transparency and the predictability and  
15 regulatory stability for the licensee community? And I'm sure you are just a  
16 gracious gentleman. So it's good as a person, I'm always happy that people have  
17 gratitude but it worries me as a regulator when I hear that the regulated community  
18 feels our licensing decisions are something to be grateful for.

19           Perhaps you're just grateful you successfully came through the process. I  
20 don't know if you want to comment on that at all. You were very candid. You  
21 talked about swimming the English Channel so the fact that there was the point of  
22 no turning back for you at one point.

1           So clearly, and again, through your candor, what I'm getting is an insight  
2   that we do have a ways to go here in terms of we have two reviews that went  
3   through, a lot of hard effort by staff and licensee but, this is clearly not how we  
4   want to be doing the 10<sup>th</sup> and 20<sup>th</sup> and 50<sup>th</sup> of these. I appreciate -- I'm not sure I  
5   have any specific questions. I seem to be falling into this trend of just making  
6   these speeches and not having any questions. But if anyone would like to  
7   comment certainly Mr. Garrett since I picked on your work choice you should go  
8   ahead.

9           MR. GARRETT: I would like to comment and I'll start off with being married  
10   for 31 years, I learned my choice of words is not always the best.

11          CHAIRMAN JACZKO: That may not have helped you right there.

12          MR. GARRETT: When I use the word "gratitude" or "grateful," there was  
13   two points. One was there was always an uncertainty, I was never sure we were  
14   going to get approval because of that uncertainty of the process. But then, also  
15   grateful because this is such a tremendous benefit for our station to have this  
16   application approved and to be able to take care of the equipment obsolescence  
17   issues, the reliability issues and most importantly, improve the overall safety of the  
18   plant. Another reason I used the word "grateful".

19          If I could, though, I wanted to go back to the point I made and I think I might  
20   have left the wrong impression. I want to clarify something. I stated that we  
21   submitted over 7,000 pages of documentation, and we did. But, two points, the  
22   first point was some of that was probably more than we needed to but a lot of that

1 documentation was because again, the NRC staff worked with us to review this  
2 kind of like in a topical fashion so that going forward, we won't have to submit as  
3 much documentation, we can do it under 50.59. So there was another reason we  
4 submitted a large amount of documentation review for this one time.

5 COMMISSIONER SVINICKI: I appreciate your return to safety, I'm  
6 accidentally falling victim to same thing that concerns me is which is both of your  
7 presentations talked so much about at the end day, I mean we do want to address  
8 obsolescence, but at the end of the day, if this is done correctly and an adequate  
9 case is made, we can be in a better place on nuclear safety and I think we can't  
10 say that frequently enough. I mean, that's a big deal as far as I'm concerned. So,  
11 there is that benefit and I think it's important to remember that. Alex, did you --

12 MR. MARION: I agree completely.

13 COMMISSIONER SVINICKI: Okay, thank you. Thank you Mr. Chairman.

14 CHAIRMAN JACZKO: Dr. Klein.

15 COMMISSIONER KLEIN: Obviously Terry if you're halfway across the  
16 English Channel, one has the option to turn back or keep going. Would you start  
17 again?

18 MR. GARRETT: Well, that's a tough question to answer. Now that I'm  
19 there, I'm glad I'm there. But, I guess I'll go back to -- I would want more certainty  
20 that I would get into this and be able to finish. I'm not sure I would start again  
21 unless I had really ironed out the process with a lot of certainty of what I have to  
22 submit, what I have to have reviewed, what efforts was going to be involved.

1           COMMISSIONER KLEIN: If you had another plant that had similar activity,  
2 do you have confidence in that certainty now?

3           MR. GARRETT: Yes. Let me answer it this way, Commissioner Klein: If  
4 another plant had used this application and we had followed along with them, then,  
5 yes and seen that they were successful, then that would have given me a lot more  
6 certainty. So I guess I would say that would have a big bearing.

7           COMMISSIONER KLEIN: As Commissioner Svinicki said, we are the  
8 regulators so sometimes we have to look at things in a little bit different light and  
9 some times are conservative. A lot of time, after one goes through a process, you  
10 do a hot wash, you look at things obviously its' up to our staff to determine what  
11 might not have been needed. Was there any follow-up after you went through the  
12 process to say, okay, here's what we did. If we did it again, we would not have to  
13 do certain steps?

14          MR. GARRETT: I don't know if I know enough if that process has occurred  
15 to look on what we call a post job brief, post review. I don't know if we have done  
16 that at this point to determine that.

17          COMMISSIONER KLEIN: I'm sure we can ask the next panel. One of  
18 things that happens in a micro-electronics area, things change quickly. And my  
19 concern is that digital systems will become obsolete sometimes quicker than  
20 analogue systems because the technology changes. Is there enough flexibility  
21 built into your systems for both of your systems to adapt as new technology comes  
22 in without having to go through such a complex process?

1           MR. GARRETT: Yes, I think there is. One of the reasons we picked the  
2   FPGA was it is a fairly well used type of card, has a lot of industry support so we  
3   think going forward it will continue to have a lot of support and use, and it also has  
4   flexibility. So I think the answer to that is yes.

5           MR. JONES: I think for the Oconee system, of course, being different from  
6   Wolf Creek, we will at some point have to make some changes as far as process  
7   becoming obsolete. The code, the software will essentially remain the same. The  
8   logic is all there and we looked ahead towards that. We got commitments for  
9   supporting the current platform for a period of time. I feel comfortable with where  
10   we are. But digital systems in a way are just like lots of other things if you have a  
11   pump that wears out, one of the things we would look at is do we put exactly the  
12   same thing, which in many cases means reengineering, paying someone a lot of  
13   money to build even a non-safety related pump or do we go to what's the new  
14   model? And does it meet our same design requirements whether it's safety or  
15   non-safety. So I think that's inevitable with digital systems, it's inevitable with  
16   analog, it's inevitable with pumps and valves too.

17           I'll answer the first question that you asked Terry, would you do it again. I  
18   can say with certainty if we knew what all we know now on day one when we first  
19   conceived the Oconee system, I would ask folks to work on something else  
20   instead. We would not go down this path. If you asked me now knowing all we do  
21   would we put another safety related digital system in one of our plants, we are  
22   going to put this on all three Oconee units, it will help other B&W plants that want

1 to put in a similar type system. But to start again with a digital system for maybe  
2 our Catawba and McGuire units that is safety related, I don't know if I would do it  
3 or not. And again, it goes back to what I said, there's got to be certainty that the  
4 investment we put in it, number one is a predictable investment. And then number  
5 two, we're going to realize it at some point and actually be able to implement and  
6 use it. So I don't know.

7 COMMISSIONER KLEIN: Do you think there are lessons learned on  
8 Oconee that would be transferred to McGuire?

9 MR. JONES: There are. There are broad lessons learned that we had, I  
10 think I mentioned, one would be on the very front end, doing lots more up front  
11 work with the staff. When we were way back in the conceptual phase, engaging  
12 the staff, that was a strong lesson learned and we have applied that on other  
13 things that we are doing for our plants that requires NRC involvement. And then,  
14 there are some narrower things we've learned too related specifically to digital  
15 systems. So there are a lot of lessons learned. That does add to the predictability  
16 but it doesn't ensure predictability. It does not ensure once you get your  
17 investment substantially spent, that you will actually get the approval needed to  
18 use it. So it is very critical when that approval comes and goes back to what Alex  
19 talked about, right or wrong the terms we use is it a licensing review that is being  
20 done or is it a design review and where is a break point in between those two?

21 COMMISSIONER KLEIN: On one of your slides, you had a comment that  
22 was interesting where approval was after the factory test acceptance. Do you

1 have an alternative to the infamous “trust but verify”?

2 MR. JONES: I think that is what it is to a great degree in my mind.

3 Licensing actions, it is always a trust but verify situation for the regulator. You  
4 have to trust that we have done our jobs up front, we have given you all the  
5 requested information, we've done the design work as needed and then you got  
6 to verify on the back end that what we said it was going to do it is actually going to  
7 do that. I think there are other regulatory means to do that other than to hold the  
8 approval until after it has been detailed, designed, constructed and factory  
9 acceptance tested. I think that's where going forward, I think that is where the  
10 industry, NEI, the NRC need to work together to try to define that and make it  
11 workable for all sides.

12 COMMISSIONER KLEIN: Thank you.

13 CHAIRMAN JACZKO: Any other questions? Well, thank you we  
14 appreciate the panel. We will now hear from staff. Thank you.

15

16 NRC STAFF PANEL

17 CHAIRMAN JACZKO: Unlike the staff who is very well scripted, we got our  
18 order mixed up, I didn't have my card out. So it created a little bit of confusion on  
19 this side of the table but we are all clear now, I think. Well, we had a good  
20 discussion from the industry. I expect we will hear some interesting things from  
21 staff so Bill if you would go ahead and begin.

22 MR. BORCHARDT: Thank you. Good morning. As we did hear on the first

1 panel, there's been an incredible amount of progress made in this area. A lot of  
2 that credit within the staff goes to the steering committee that you will hear some  
3 discussion of. I also would like to, in addition to the ISGs and the other things that  
4 have been accomplished, just to make clear that one of their responsibilities and  
5 one of the things they've been successful on is making sure we had very close  
6 alignment between the program offices throughout the NRC.

7 We have different licensing processes for new reactors and for currently,  
8 operating reactors. I think that has some implications on how we make technical  
9 decisions and when we make them. But the essence of the technical issues there  
10 is very strong alliance between all the program offices and that was one of the  
11 charges of this group. I would like to congratulate them for the success they had  
12 and will turn over to Jack now who will begin the presentation.

13 MR. GROBE: Thank you Bill. Good morning. This is our fourth meeting in  
14 approximately 30 months to discuss the safety application of digital technology at  
15 our regulated facilities. Our goal today is to update the Commission on activities  
16 we have completed, progress to describe progress in other areas that are  
17 addressed in the project plan to discuss a little bit of the licensing actions we  
18 completed and those underway. And to discuss additional activities that we have  
19 identified now that we need to address going forward.

20 Next slide please. We have five presenters today. I'm going to provide a  
21 little bit of background information and then I'll turn it over the Anne Boland. Anne  
22 is the Acting Director of the Division of Engineering in the Office of Nuclear

1 Reactor Regulation and she's going to talk about operating issues. The new  
2 reactor perspectives will be provided by Ian Jung. Ian is one of the Branch Chief's  
3 for Instrumentation and Control of Electrical Engineering in the Division of  
4 Engineering in the Office of New Reactors.

5 Marissa Bailey is the Deputy Director for Special Projects and Technical  
6 Support in NMSS, That's the Office of Nuclear Materials and Safeguards, and  
7 she'll be discussing activities involving digital technology at fuel cycle facilities.

8 Stuart Richards will wrap up with research activities. Stuart is the Deputy  
9 Director of the Division of Engineering in the Office of Research. I'll summarize  
10 and certainly respond to all your questions at the end of our presentation. We do  
11 not have a presentation today from the Office of Nuclear Security and Incident  
12 Response. NSIR part of the steering committee and their principle focus is cyber  
13 security. The reason for that is there is a dedicated meeting later this year on  
14 cyber security and they will be discussing these issues at that meeting.

15 Next slide please. The steering committee was formed approximately two  
16 and a half years ago, it includes executives from all five of the affected program  
17 offices. Its role is to facilitate consistent resolution of the technical and process  
18 issues involving digital technology as well as to be the principle focus for  
19 interaction with the industry. The steering committee established 7 task working  
20 groups, one in each of the principle areas of concern and the steering committee  
21 and the task working groups developed a project plan.

22 The project plan defined with the industry with an extreme amount of clarity,

1 the specific problems -- there were 25 problems statements in the project plan.  
2 The vast majority of those have been resolved today. On the near term, the tasks  
3 in the project plan including developing interim staff guidance and longer term to  
4 incorporate that interim staff guidance into our regulatory infrastructure. That  
5 infrastructure would involve regulatory guides, our internal standard review plan as  
6 well as industry consensus standards where appropriate.

7 The steering committee has interacted with industry extensively through  
8 counterpart groups that industry established. Amir Shahkarami who is not here  
9 today is my counterpart on the industry's executive committee and then they have  
10 task committees that mirror our task working groups and that's been very effective.

11 Slide 4, please. We have accomplished a great deal. All of the technical  
12 issues regarding reactors application of digital technology at reactors have been  
13 resolved. Those ISGs are issued. As a matter of fact, the last revision that Alex  
14 mentioned in his presentation on the diversity of depth in depth guidance was  
15 issued this week. There's been significant value added from that guidance. The  
16 predictability and efficiency in the licensing process has been improved. And for  
17 Wolf Creek and Oconee that came midstream. For future applicants that will be in  
18 place ahead of time. .And Ian we will get into more detail on these issues.

19 We have begun to incorporate that guidance into our regulatory  
20 infrastructure.

21 Slide 5. While we have accomplished much, there is much more to do.  
22 Two of the interim staff guides are in final development. Ann will talk in more

1 detail about the licensing process for operating reactors and Marissa will talk about  
2 the fuel cycle guidance. Both of those guides will be issued this year. We have  
3 identified some additional focus areas that we will not be adding to a task working  
4 group or a project plan, we will be handling through our routine management  
5 structure. Ian will discuss some additional work in the guidance on the design  
6 acceptance criteria that the Office of New Reactors is working on. Anne will talk  
7 about the operational issues and Stu will discuss ongoing and future research. At  
8 this time, I'd like to turn it over to Anne Boland.

9 MS. BOLAND: Thank you Jack, I'm pleased to be here today. I plan to  
10 discuss the staff's experience in using interim staff guidance documents or the  
11 ISGs for the license application reviews for operating reactors. The purpose of the  
12 ISGs is to provide a consistent framework to guide the staff in their licensing  
13 reviews. That is number one effective from a safety stand point and two,  
14 predictable from a process standpoint. The ISGs themselves are not regulatory  
15 requirement, however, they prescribed a set of positions or guidelines which if  
16 followed in the license amendment process, or in the design submitted by the  
17 licensee, the intent is to minimize or to streamline the NRC level of review. So  
18 they play an important role in I think some of what you have heard this morning  
19 related to the amount of in depth of your review. Today for the applications we  
20 received, the primary ISGs that we have used or ISGs 1, 2 and 4: ISG 1 relates to  
21 cyber security and it provides guidance and clarification on the cyber guidance  
22 contained in Regulatory Guide 1.152 for safety related equipment and correlates it

1 to the more general guidance contained in NEI 04-04. ISG number 2 relates to  
2 diversity and defense in depth.

3 It provide guidance to staff on how to meet defense in depth criteria  
4 including the details of how the staff can go about evaluating manual actions that  
5 are credited for diversity. And then ISG 4 relates to digital communications. And  
6 the focus of that ISG provides a number of positions relative to how the safety  
7 function can be maintained of a system given different communications  
8 configuration such as communications between safety divisions or  
9 communications between safety and non-safety related equipment.

10 Next slide, please. As you heard this morning from the industry, we applied  
11 the ISG's to two recent applications, one being the Wolf Creek application and the  
12 other being Oconee. In the Wolf Creek application, staff has obviously completed  
13 its work and this was a challenging review for us because it was a first time review  
14 of a particular technology. So we were looking at the platform itself as well as the  
15 application of that platform. Even though this application was submitted prior to  
16 the initial development of the ISGs, the staff did use the ISGs to guide their  
17 reviews and that review was somewhat streamlined if you compare it to Oconee  
18 because many of the positions that were taken in ISGs were met by the  
19 licensees -- by the design. Therefore, additional and more in depth review was not  
20 required. Oconee, on the other hand like I said, it is a more complex review,  
21 certainly a more complex system and in that case, the licensee did request to use  
22 an already existing platform. However, there were changes to that platform and

1 because of those changes staff needed to do a review that went beyond the  
2 original review that we had done for the platform.

3           Additionally in the Oconee case, again, the license application may not  
4 have had the benefit of the ISGs upon submittal but many of the ISG positions  
5 were not met. As such, staff needed to take a look more in depth at each of those  
6 alternatives to determine if our underlying regulations were in fact met.

7           To tailor on to your point, Commissioner Lyons on being a learning  
8 organization, we did conduct a workshop in May with Oconee and Wolf Creek as  
9 well as vendors and other members of industry to get lessons learned. Our goal  
10 was we wanted to understand how our process worked, how the ISGs did or didn't  
11 work and we held that workshop. And the consensus was in general that the ISGs  
12 were effective and did improve the process of processing the licensing  
13 amendments.

14           So we are continuing to look at lessons learned ourselves. It is our intent to  
15 factor that in as we move forward. Next slide, please: The large piece of what we  
16 do have remaining to do in that regard is creation of ISG Number 6. This ISG as  
17 has been discussed previously is intended to define the licensing process with the  
18 objective of providing a more predictable and consistent licensing process related  
19 to digital I&C. As I indicated, we do intend to factor in the lessons learned and we  
20 will continue to do so as we get additional reviews in this process.

21           This guidance document is in draft and we are working proactively with the  
22 Industry to finish this effort by September of this year. Right now, as envisioned,

1 this ISG provides a tiered approach to the license review process depending upon  
2 the complexity of the amendment application. And I guess from a conceptual  
3 standpoint, what it focuses on is number one, early communications for the  
4 pre-application phase. What is it that is being planned? What interactions do we  
5 need to have to gain an understanding? So early communications before the  
6 application, then the timing of continuing communication, the level of information  
7 that we need and the timing of that information. So that's kind of the vision for this  
8 ISG and we are working toward as I indicated trying to get this completed by the  
9 end of September.

10 Next slide, please: Jack mentioned operational issues. As we've been  
11 working through the ISGs and also discussing with industry the implementation of  
12 digital technology in the operating reactors, both the staff and the Industry have  
13 identified that there could be implications on some of our more core regulatory  
14 programs, if you will, resulting from the application of digital I&C. Many of our  
15 programs have a risk perspective to them such as the significance determination  
16 process and due to some of the challenges with modeling digital I&C systems for  
17 risk, we need to take a look at those processes to see if we need additional  
18 guidance or are those processes in a position to handle these special cases at this  
19 point.

20 So, again, we held meetings with industry. We did that in May to try to  
21 scope these issues. We have come up with some specific issues that we need to  
22 follow up on and the Digital I&C steering committee will be working with staff

1 responsible for those various programs to look for path forward and develop  
2 guidance as appropriate. That concludes my presentation and I will pass over to  
3 Ian Jung of the Office of New Reactors.

4 Thank you Anne. Next slide. As Bill mentioned earlier, maintaining  
5 technical consistency is very important as multiple offices are involved in digital  
6 I&C activities. The agency's offices worked effectively together to establish  
7 technical consistency. As Anne just mentioned, we developed staff guidance  
8 including ISGs and technical acceptance criteria that we are going to use in  
9 licensing applications jointly using formal process. The cognizant staff members  
10 from various offices were trained on some of the key ISG documents. The ISG  
11 documents are also used by NRO, NRR and other offices consistently and we  
12 communicate informally on those subjects.

13 In addition to emphasize the consistency, the directors of the NRR,  
14 Research and NRO engineering divisions meet on a regular basis to discuss any  
15 consistency issues or coordination issues. As we do at the branch chief level as  
16 well. We document the results and we continue to track to make sure we have a  
17 common understanding of those issues. Specifically in NRR and NRO, we  
18 developed also an internal procedure to follow. We apply peer reviews, joint  
19 reviews or concurrence process for issues that involve both operating reactor and  
20 new reactor issues.

21 Next slide. The steps for licensing review of new reactors under Part 52  
22 framework is well underway, as you know. Three design certification applications

1 one design certification amendment and a number of combined license application  
2 reviews are in various phases of staff review. In addition, there are topical reports  
3 and technical reports submitted in support of the design certifications are also  
4 under staff review.

5 For new reactors, staff is being asked to review complete platform software  
6 and hardware that are digital for both safety and non-safety systems. Although it  
7 represents a significant amount of work for the staff members, NRO staff along  
8 with contractor resources, is striving for efficient and effective licensing process  
9 while focusing on safety.

10 The staff also works closely with industry and applicants and other  
11 stakeholders to resolve many issues that are being identified through the public  
12 meetings and other vehicles as well. The NRO staff dedicated and talented, works  
13 very hard and their review activities support the mission and vision and goals of  
14 the office that's been established as well as the agency. The reviews are  
15 particularly aided by the ISG documents we generated and staff uses these ISG  
16 documents in new reactors and we use ISGs 1 through 5 on a regular basis. The  
17 ISG documents contribute to more effective safety reviews for the staff and  
18 improved licensing certainty for sure.

19 In addition, the design centered review approach, well adopted in new  
20 reactors provide greater standardization and licensing efficiencies. This is done  
21 through the concept of one issue, one review on one resolution concept. For  
22 digital I&C, much of the I&C reviews are done at the design certification stage.

1 Relevant combined operating license applications reference the design  
2 certification, therefore, no additional reviews are required in much of the I&C  
3 design areas.

4           Next slide. Sharing of operating experience and lessons learned from other  
5 countries is very important, as you know. For new reactors, staff uses various  
6 mechanisms, bilateral meetings, IAEA interactions, OECD /NEA interactions and  
7 other international conferences and meetings. NRO has had interactions with most  
8 of the countries with digital I&C experience in power reactors for RPS systems  
9 including Japan, Korea, France, UK, Finland and Taiwan most recently. In  
10 addition staff participates in the multi-national design evaluation program initiative  
11 on both a design specific and issue specific basis. NRO staff's participation in the  
12 design specific EPR digital I&C working group directly supports the current US  
13 EPR design certification review as well as the topic reports associated.

14           In addition, Terry Jackson, one of my fellow branch chiefs chairs that group  
15 providing the leadership to this multi-national effort, We also participate in the  
16 issue specific digital I&C working group which I chair. This working group provides  
17 venues for additional information sharing mechanisms on digital I&C issues. This  
18 particular group also works to develop ways to enhance more efficient and  
19 effective licensing reviews moving forward. We share what we learn through  
20 IMDEP with other offices for their awareness and their potential benefits as well.

21           In summary, NRO's international collaboration in digital I&C is active, much  
22 needed and very much beneficial. Main contribution is knowledge management

1 aspects of it, plus it really helps current licensing reviews. These benefits are also  
2 mutual among the participating countries as well.

3 Next slide: As Ann mentioned earlier as well as Jack, there are a couple of  
4 areas we are working on that I would like to highlight. One is as the resolution  
5 activities for digital I&C, DAC and ITAAC are implemented for the first time the  
6 staff recognizes the benefits of additional guidance on the subject.

7 So staff has proactively begun developing interim staff guidance on the  
8 subject moving forward and we intend to complete this ISG by the end of this year  
9 and will engage industry and other stakeholders too along the way. Another area  
10 that I would like to highlight is the areas of consensus standards and more  
11 common regulatory practices. We have learned from international activities  
12 including IMDEP that there's a longer term need for consensus standards and  
13 more common regulatory practices which will have an impact on more efficient and  
14 effective licensing reviews in the future. This is more important in this ever  
15 growing global commercial nuclear framework and ensuring safety is a global  
16 responsibility. The IMDEP working group that I chair, we are working with the  
17 IAEA and other standards development organizations like IEEE and International  
18 Electro Technical Commission on the subject and we would like to also work with  
19 other offices on this subject as we move forward. With that, I'll turn it over to  
20 Marissa.

21 MS. BAILEY: Thank you Ian. Good morning. I'm on Slide 14 and I will be  
22 briefly covering the work that's been done for fuel cycle facilities. NMSS has

1 worked with its industry stakeholders as well as coordinated with the other  
2 program offices to develop Draft Interim Staff Guidance 7 which provides review  
3 guidance for the use of digital I&C systems at fuel cycle facilities. It is important  
4 just like in reactors that digital technology be used correctly at fuel cycle facilities.  
5 Of course the risk from these facilities are significantly less than that of reactors  
6 and our review criteria would be based on the regulatory requirements in 10 CFR  
7 Part 70. As a quick background under 10 CFR Part 70, licensees are required to  
8 perform an integrated safety analysis or an ISA, which is a systematic look at the  
9 facility hazards, their likelihood of occurrence and their consequences. Through  
10 the ISAs, the licensee identified items that are required for safety, or the IROFSs,  
11 which are put in place to either mitigate or prevent an accident sequence. And  
12 management measures are then implemented to ensure the reliability and  
13 availability of those IROFSs. ISG 7 provides an acceptable approach or discusses  
14 an acceptable approach for management measures that could be applied to digital  
15 I&C systems at fuel cycle facilities.

16 Specifically, ISG 7 covers cyber security, functional independence, digital  
17 communications and software quality. That is the scope of ISG 7. And as I  
18 indicated earlier, the ISG was developed through a public process. We held a  
19 number of public meetings with our stakeholders and discussed the ISG. In fact,  
20 the scope of this ISG was largely influenced by feedback that we received from  
21 our stakeholders during those meetings. As far as our next steps go, we plan to  
22 issue the ISG this month for public comment, incorporate those comments and

1 publish the final by September, 2009. That's basically what I have for fuel cycle  
2 facilities and I would like to turn it over to Stuart Richards of Research.

3 MR. RICHARDS: Good morning. I would like to talk briefly about the Office  
4 of Research activities. As I'm sure you're aware, we conduct research to support  
5 the program offices in developing regulatory guidance and revising existing  
6 guidance. Also we do confirmatory research based on work done by industry. For  
7 example, we are working on looking at diversity and digital systems and in the long  
8 term will be looking at I&C systems for advanced reactors. We work with a variety  
9 of the national laboratories and universities but we also reach out to other  
10 domestic and international organizations. I think Mr. Marion mentioned that we  
11 have an MOU with the Electric Power Research Institute and we also have worked  
12 with the Halden Project in Norway. We reached out to other government  
13 agencies, for example, we worked with NASA and we worked with Naval Reactors  
14 and we participate in a kind of an information sharing organization within the  
15 Government talking about computer systems and software.

16 We also work with NEA on their international database, on computer  
17 system failures which is also referred to as the Compsis Project. Our work is  
18 guided by a five year digital research plan. That plan, present plan in place  
19 expires this year so we are in the process of developing our next five year plan to  
20 cover the period from 2010 to 14. We work with our internal stakeholders and will  
21 be talking with the ACRS about it and also go out to the public and in industry for  
22 input on that plan.

1           Next slide please. Digital I&C systems, of course, are required to be high  
2   quality and with high reliability. One way to accomplish that in the design is by the  
3   use of diversity. One challenge is that it's possible for an applicant to come into  
4   NRC and propose to use the same software and hardware for the various  
5   channels within a safety system. The concern that arises from that is the common  
6   cause failure possibility.

7           So we looked at what other industries and other countries have done in this  
8   area. We've gone and looked at the aviation industry, manned space flight,  
9   railroads and we have also looked at foreign nuclear power plants where they  
10   have already implemented some forms of digital I&C. Based on the results of that  
11   work, we hope to be able to come up with more definitive guidance on what  
12   constitutes sufficient diversity for the purposes of licensing plants here in the  
13   United States.

14           When you carry out safety assessments of these digital systems, one of the  
15   ways of doing that is a failure mode and effects analysis review. I think you talked  
16   about it some in the first panel but failure modes are really not well understood at  
17   this point. So we are putting a lot of our focus on that. I think the Commission got  
18   specific feedback last year from the ACRS and we were directed in the Office of  
19   Research to focus our work on this. Thus far, we spent most of our time looking  
20   at operating experience and the results have not been particularly good. It will be  
21   a challenging to work on and we have a long ways to go on that. As I mentioned  
22   before, we are also looking at advanced digital I&C systems for future designs and

1 as previously mentioned, we are also looking at cyber security. That concludes  
2 my remarks.

3 MR. GROBE: Thanks Stu. In summary, the staff has licensed digital  
4 systems for use in our regulated facilities. And we have more licensing actions  
5 currently under review. Technical guidance has been developed for reactors and  
6 that technical guidance is in use and provides additional clarity and predictability.

7 We certainly have more to do and we are absolutely committed to complete  
8 the remainder of the near term actions in the project plan this year.

9 We have been contacted by Diablo Canyon who has indicated they would  
10 like to be the next operating reactor pilot for using IGS 6 once it is completed.  
11 They anticipate submitting their application, mid-year next year and identified 3  
12 time frames beginning this summer when they want to meet with staff to go over in  
13 detail how the application should be structured and using our interim staff  
14 guidance documents. So we are committed to work with Diablo Canyon as the  
15 next pilot. We also plan to continue to learn as our knowledge evolves, as  
16 technology's evolves, we will be in a position to meet tomorrow's challenges. This  
17 completes our presentation and we're certainly available to answer any questions.

18 MR. BORCHARDT: Before we open up for questions, I wanted to touch on  
19 a couple of personnel things. One is I think that you have noticed the constantly  
20 increasing capability of the staff over the last five years. We are really developing  
21 a good core of expertise. The senior level individuals that we have bring a very  
22 high degree of expertise with them. I think we have people from the non-nuclear

1 industry. We have an individual from another Government agency. We have a  
2 person who has a long NRC experience. We have somebody out of the Navy  
3 nuclear program. So they bring a very broad breadth of knowledge that is being  
4 shared throughout the agency even though they reside in one office or another,  
5 they really are an agency resource that's being very effectively utilized. And  
6 finally, I would like to acknowledge Anne to my right here who's been on a 3 month  
7 rotation from Region III and has been serving in the capacity in NRR doing an  
8 excellent job in contributing very much to these efforts and this is just another  
9 example of how effective these kind of rotational development programs work  
10 within the staff. We are ready for questions.

11 CHAIRMAN JACZKO: Well thanks Bill and I appreciate those comments.  
12 It has certainly from my experience watching this issue, we have made  
13 tremendous progress. There may still be challenges as we go forward but we  
14 have made progress in completing a lot of the staff guidance and interim staff  
15 guidance and other actions. I'm sure Commissioner Lyons will explore some of  
16 those issue and others in his questions.

17 COMMISSIONER LYONS: Yes, but I would like to start with compliments  
18 to all of you. I wonder if maybe three or so year ago as you and the staff were  
19 embarking on this journey just as industry wasn't quite sure what they were getting  
20 into, I wonder how many of you knew what you were getting into too? It has to  
21 have been, I hope a very exciting but complex journey where maybe it was not  
22 quite obvious when we started where that journey would end, and as you point

1 out, it has not ended and it isn't going to end for a long time. But on the other  
2 hand, certainly, I could not have begun to guess three years ago or whatever  
3 number of years I should say, you said 30 months, Jack so 3 years is a rough  
4 guess, I could never have guessed 3 years ago that you folks would have come  
5 this far and the industry would have come this far.

6 And just my admiration and thanks. Bill commented on the new staff and I  
7 was going to comment on that too, Bill. I think now, I just agree with what you  
8 said. I've been very, very impressed with the caliber of folks that have been  
9 recruited to join our staff as we began this, that it was necessary to strengthen our  
10 technical capabilities in some areas, the fact that you folks went out and found  
11 outstanding staff in a number of different places. Again, my compliments. I have  
12 had opportunities to interact with a number of the staff in this area. And I've been  
13 very, very impressed.

14 By way of starting into questions, this first one probably will end up going to  
15 Anne but you can decide as I get through it Anne. I would start it with the  
16 comment or the observation sort of following up on what Ian said that in the new  
17 reactor area we talked a lot about designed centered reviews, we talked about one  
18 issue, one review, one decision.

19 And we certainly heard the concerns from industry about the burden that  
20 they have seen from their end of this process as we have gone through these first  
21 two applications. I'm curious if you see opportunities for subsequent pilots, maybe  
22 Diablo Canyon, maybe other applications to take advantage of the lessons you

1 learned and in some sense maybe it can't be done exactly but I wonder if we can  
2 be moving toward something like design centered review concept in terms of  
3 taking the learning experiences from Wolf Creek and Oconee and applying them  
4 to whatever the new situations will be? You spoke to this to some extent Anne in  
5 your comments but I'm wondering if you would like to expand or if any one else  
6 would like to?

7 MS. BOLAND: I'll start. I do think ultimately as we are structured right now,  
8 if the license applications address the factors that are contained in the standard  
9 review plan, and the ISGs, I think that is one of the first steps to decreasing the or  
10 streamlining the NRC review. And so that's one aspect. And as we move forward  
11 in developing ISG 6, we definitely want to take the learnings from Oconee, the  
12 feedback we are receiving from industry and factor that into that process. And we  
13 do have ongoing discussions in relationships with NRO on their process. So we  
14 are trying to look at their process and our process to see how we can develop ISG  
15 6 going forward.

16 Ultimately, we have a reasonable assurance conclusion to make whether  
17 that's for a new reactor or for an operating reactor. Our processes may look  
18 somewhat different but we ultimately have the same standard and so what we  
19 need to do in developing ISG 6 is work internally, take feedback externally and  
20 work that into the process moving forward.

21 COMMISSIONER LYONS: I appreciate those remarks and the workshop  
22 you described probably also very much fit into this process of learning. Certainly

1 as you emphasized, we don't want to compromise the quality of the reviews, that  
2 has to be maintained. But to the extent you can apply these lessons, move to  
3 whatever extent possible toward design centered approaches, presumably, that  
4 will lead to perhaps some reduction in the 27,000 pages which I'm guessing you  
5 don't want to see any more than industry wants to provide it. It's probably far more  
6 important to provide the much smaller number that is actually needed to provide  
7 that quality review.

8 MR. BORCHARDT: Clearly, there are some lessons that we can learn. We  
9 want to take advantage of those. But I can't let the opportunity pass. One of the  
10 prerequisites, if you will, of the design centered concept is standardized  
11 applications and since the 104 reactors are starting from a different base and  
12 you're doing design mods on those 104, that's going to make it more challenging.  
13 I'm certainly not implying that we can't make improvements and we're motivated to  
14 do so but it's not exactly the same situation.

15 COMMISSIONER LYONS: I very much agree, Bill, I use the design  
16 centered review words with some hesitation but at least, I think there is some  
17 analogy in there, not perfect.

18 MR. GROBE: We're also attempting to leverage the processes that new  
19 reactors is putting in place to see if those can be utilized in operating reactor  
20 space. The new reactor approach under Part 52 includes 2 points where the  
21 agency touches, digital I&C is what we are talking about today. The first is in the  
22 design certification and the license application and the second is the closure of the

1 ITAACs. The review is completed when the COL and the design cert is issues,  
2 but the agency has a second decision to make and that is whether or not that  
3 design was adequately implemented. Under Part 50, it is a one step licensing  
4 process.

5 So the steering committee has challenged the staff to work with OGC to see  
6 if there is some way in which you can replicate in operating reactor space, the  
7 concepts we are using in new reactor space. The difficulty with digital is unlike  
8 thermodynamics and fluids and neutronics where we have an extensive amount  
9 of empirical information and well developed codes. We do independent  
10 calculations to make sure that there is reasonable assurance that the design  
11 licensee submits –

12 COMMISSIONER LYONS: At the certainly of the physical processes –

13 MR. GROBE: ACRS keeps us on our toes there too. In digital the  
14 technology is evolving rapidly. The designs are not going to be completed when  
15 the applications are submitted for Part 50 license amendment. So these are the  
16 types of challenges. Ron Jones spoke of regulatory certainty. I'm not sure which  
17 is more certain, getting a review on high-level design concepts and an inspection  
18 just before you want to restart the unit, or having the review progress through the  
19 stages and understand how the staff is understanding and agreeing with your  
20 design concepts as they are completed. So these are the issues we have to  
21 discuss with industry.

22 COMMISSIONER LYONS: I'm out of time, let me stop. If there is another

1 round, I might have one or two more depending on what we discuss.

2 CHAIRMAN JACZKO: Well, Jack, maybe I will follow up on that issue a  
3 little bit of perhaps level of detail and design review and those aspects. Maybe  
4 you can characterize to what extent this is similar, different from how we review  
5 other types of safety related equipment. Are there parallels and analogies here or  
6 is really not something --

7 MR. GROBE: I think one of the very complex areas that we review is core  
8 design. And the differences are that we have very clear benchmarked codes in  
9 which we can do independent evaluations of the way in which the vendors in this  
10 case have designed the cores.

11 In the case of digital, the quality of the design is strictly dependent on  
12 humans and a process, a design process. And it's a very different type of review  
13 we have to engage in. We have accomplished those reviews on a number of  
14 occasions both in topical reports and licensing actions.

15 The challenge we face is streamlining the licensing process that provides  
16 the most level of predictability and minimal regulatory uncertainty that we can  
17 while still getting the details that we need for the reasonable assurance evaluation.

18 CHAIRMAN JACZKO: I appreciate that. I think we have talked a lot about  
19 certainty, predictability and streamlining, but of course, the fundamental underlying  
20 issue we are worried about is safety and I think obviously, that in the end becomes  
21 the most important issue and we want to make sure we are doing the right reviews  
22 to make that reasonable assurance finding and that in the end is paramount of

1 course.

2 As you look out on the horizon, we have had these various task working  
3 groups that have been in effect now for several years. A lot of the interim staff  
4 guidance has been developed. Where do you see the task working groups going?  
5 Do you think there is a time to sunset them? Is it something we can put into the  
6 more traditional NRC process eventually?

7 Mr. GROBE: The steering committee has addressed this question. And in  
8 the project plan, it specifically has the point of time where the TWGs will be  
9 sunsetted. And the steering committee concluded the appropriate place for that is  
10 when the draft final infrastructure document, whatever it might be, is drafted and  
11 out for public comment or industry comment.

12 So whether it's a consensus standard from the IEEE, or standard review  
13 plan or regulatory guide, we laid out those schedules and identified where the  
14 TWG will be sunsetted. We face the decision of whether or not these new issues  
15 identified that Anne spoke to, should we create a new TWG or should we handle  
16 that through our regular management processes. The decision was no, let's wean  
17 ourselves off of the project plan the TWGs. The steering committee felt that it  
18 was important that it stay in existence to ensure this work continues in a consistent  
19 fashion across the offices, but that we don't meet that belt suspenders approach  
20 for these next issues.

21 CHAIRMAN JACZKO: I certainly think getting into the more regularized  
22 process will help with some of those predictability issues and other things as we

1 go forward.

2 The next question I had is really a follow up to some extent to what you just  
3 said and that is namely how do we get rid of the I in the ISGs and we have for  
4 each interim staff guidance, we have a plan that as you just mentioned to put that  
5 into either standard review plan or industry consensus document, whatever the  
6 right form of guidance would be to make it permanent.

7 MR. GROBE: You want to take a crack at that? We have an extremely  
8 diverse set of responsibilities here. It turns out that project management for the  
9 standard review plan update is in the Office of New Reactors. And the latest  
10 revision of the project plan that we just updated, Revision 2, includes a great deal  
11 of detail on how these will be incorporated into the regulatory infrastructure  
12 documents. The most important one is the Standard Review Plan.

13 That's all been resource loaded. The schedules is in there, schedules that  
14 we are comfortable we will be able to live through. Most of the documents will be  
15 completed this year.

16 Some will go out to future years and there is some synergy between the  
17 work digital is doing as well as some of these chapters in the standard review plan  
18 have many other components that feed into them. So some of them go out to late  
19 2010. That's just simply the digital piece will be done but it will be waiting to  
20 finalize with other pieces coming from other groups.

21 CHAIRMAN JACZKO: As I said, we focused a lot on some of the process  
22 kind of things. And I think it shows the progress that we made because when I

1 first remembered these meetings, we were really talking about safety issues and  
2 we were talking about what do we mean by defense in depth, what are the right  
3 kinds of things to do from a safety standpoint and I think we have come a long way  
4 that we have really put those issues I think the staff has come to a good resolution  
5 of what those issues are and how we should address the safety issues. And how,  
6 we are dealing with implementation issues and I would see that, to some extent,  
7 as a sign of progress. And obviously, we have approved the Wolf Creek digital  
8 system and are on process for Oconee as well. So, sometimes we perhaps can  
9 get loose the forest for the trees here and forget the progress we have made. And  
10 that's again, our driving interest in doing all of this has been to have the right kind  
11 of safety review for what is arguably a new area for industry and for us. So I think  
12 you should be pleased with the progress you have made and work that's been  
13 done by staff to get there. Commissioner Svinicki.

14 COMMISSIONER SVINICKI: Thank you. I would like to add my  
15 compliments for the tremendous work that's been done and people have reflected  
16 on 3 years or 30 months but I will say even in one year, one of the first concerns I  
17 heard when I arrived at NRC was we really needed immediate attention to  
18 increase our bench strength on digital I&C and I think both through targeted hires  
19 and just the tremendous work and experience of these two pilots with staff, we had  
20 already had with a lot of nuclear expertise, I think we've come a long way. Even in  
21 a year, I've seen very visible progress so I think that's a compliment to everyone.  
22 And although intuitively, I'm sure I understood that there was a very large

1 coordination effort between the various offices in NRC, I don't think until I was  
2 listening to the presentations this morning, I really understood all the moving  
3 pieces so I appreciate the collaboration.

4 Ms. Bailey, I appreciate your presence here today because the materials  
5 piece is important and as I think we are very focused on reactor related pilots we  
6 might forget about the fuel cycle facilities but you are not forgetting about it and  
7 that's the important thing. And NMSS is not forgetting about it and it is a different  
8 application.

9 You talked about the hazard profile and the risks and going to a whole  
10 different Part 70 so we have got to have traceability to that. And I appreciate  
11 though that you are drawing from the experiences on the reactor side and pulling  
12 that in.

13 And I won't profess to have read all of the interim staff guidance that we  
14 were provided but I skip read it enough to be very impressed with the amount of  
15 work that's done there. And Ms. Boland, I appreciate that you said it's not  
16 requirements, and we understand that. But it is one vision for an applicant or  
17 potential applicant who is thinking about entering this process to say this is one  
18 pathway that the staff has identified and maybe encourage is too strong a word but  
19 at least you would have some idea that if you pursued that path, you would kind of  
20 know what you are getting into. We're focused on process as the Chairman said,  
21 but those mechanics are important in terms of any potential applicant's willingness  
22 to even enter this process until they can have a sense of that.

1           And Mr. Grobe, you mentioned for those two pilots, that kind of predictability  
2   and transparency came kind of midstream as Mr. Garrett was half way across the  
3   English Channel. At least he got to have a better sense of the predictability and  
4   the transparency into the repeat process.

5           But I'm not sure, I think that our first panel had the question of boy, would  
6   you do this again, if you could do it. Now, staff does not have that luxury so I can't  
7   pose that same question because you would have to conduct the review. But I  
8   might change the question a little bit to say, if you could have done things a little  
9   bit differently and it maybe something as simple as boy if that interim staff  
10   guidance could have materialized sooner, but the converse of that is of course, the  
11   interim staff guidance was informed by the pilots. So it's a little bit of a chicken  
12   and the egg thing there, but -- Jack for you or anyone else, is there anything, you  
13   would put forward to say if might have been a little more effective to sequence it  
14   differently or do something or as we might be courting Diablo Canyon or others to  
15   entice them to put forward some sort of amendment, what might we do differently,  
16   just even for the next couple?

17           MR. GROBE: I'm going to pick on Terry Garrett. The thing that we  
18   emphasize with complex licensing actions is very early communication with the  
19   licensee. And we set up a structure with Diablo with three extensive, these will  
20   probably be day long meetings. First one will be in July of this year to go over  
21   expectations and the guidance to make sure there is a common understanding  
22   between the design engineers that are working for the licensee on the application

1 and our staff.

2 In the case of field programmable gate array at Wolf Creek, there were 3  
3 interesting concepts that had we had the opportunity to meet a year before that  
4 application came in could have been resolved. The first one is licensee did not  
5 view that as a software based system. It's true that the software is burned into the  
6 memory of the device but it is software and there has to be a high quality software  
7 development process. And there was not what I called the mind meld on that.

8 Second is that the licensee believed that the system was not susceptible to  
9 common cause failure when in fact, it had two cores that were identical and there  
10 was a very easy fix once we came to an understanding of that. And that was the  
11 vendor put in two separate cores that worked differently -- that bounced off each  
12 other. That's why as Terry indicated, the system does not require any diverse  
13 actuation. And the third thing, the system was designed to FAA codes. That's  
14 fine, I'm sure those are good codes but we don't understand them. We didn't get a  
15 translation or crosswalk from the FAA code to our codes and the system was not  
16 designed to our codes.

17 So that was a complication early on. Had we been able to discuss those  
18 issues very early, a year before the application was submitted, we could have  
19 resolved those. So that's the most important lesson learned and not just  
20 applicable to digital. We apply that to all of the most complex licensing actions we  
21 engaged in. We have multiple pre application meetings with the licensee.

22 COMMISSIONER SVINICKI: And I want to acknowledge that Ms. Boland

1 did mention that in terms of talking through the lessons learned and the things that  
2 have already been incorporated. She was - and I made note of this in my mind  
3 because I realize how important it was, as she was saying it, but she said that the  
4 pre-submittal interactions are absolutely key and I need to acknowledge you did  
5 mention that and that is very important.

6           The other reaction I would give, Jack to your answer is that a thought  
7 maybe that I was going to close with was that the Chairman mentioned that I don't  
8 know now the time frame, he said maybe a year ago or 3 years ago, we were  
9 talking about very substantively in these types of meetings about what is defense  
10 in depth and various concepts. And now, we are talking process. And I agree with  
11 your point that in and of itself is indicative of process that has been made, but the  
12 other variation on that that I would add is that as we get into seeing these  
13 amendment requests will be very diverse, as the point Mr. Borchardt made.

14           So as we get into them, amendment by amendment, I suspect that there  
15 will be new substantive conversations about defining diversity, defining defense in  
16 depth because these things are notional. You discuss them as notional until you  
17 have these diverse amendment requests in front of you and then you move from  
18 your concept of what those terms mean to what does the applicant think it means.  
19 What do you interpret it to mean? I suspect we have evolution in learning on the  
20 definitional concepts just as you mentioned with Wolf Creek that their were not  
21 some common understanding about how we were defining various things that  
22 equipment that was going to be installed or even conceptually how we looked at

1 those systems. We will continue to increase our understanding but again, very,  
2 very impressive of the work and the progress that has been made. I close with that  
3 compliment. Thank you.

4 CHAIRMAN JACZKO: Dr. Klein.

5 COMMISSIONER KLEIN: Thanks for a good presentation and I'd also like  
6 to acknowledge the progress you have made in your good hires in the digital I&C.  
7 That is an area that we needed to build our capability. You have really done a  
8 good job in attracting some very talented people and hopefully, we will continue be  
9 able to do that and expand. I thought Bill's comment on the 104 different reactors  
10 is a good one. I think Anne in NRR has a more challenging aspect compared to  
11 what Ian has in NR0 when the reactors are not there yet. So you have both an  
12 existing facility that you have to deal with and keep it running while you put in new  
13 systems and similarly with hopefully, the fuel cycle, the new facilities that will take  
14 advantage of these digital activities.

15 Hopefully on the interim staff guidance, we won't have 104 different ones for  
16 the 104 different reactors. Hopefully, they won't go that high. I guess, I had a  
17 question for you Anne. When you did the workshops and take the lessons  
18 learned, where do those get implemented in the staff guidance? In other words,  
19 I'm sure after you have gone through both Oconee and Wolf Creek, there are  
20 things you probably don't need to ask and there are probably things that when you  
21 went through the process that now you want to ask. So where do those manifest  
22 themselves for the next pilots?

1 MS. BOLAND: Where we see that is actually what you said, we are looking  
2 at trying to incorporate those learnings into ISG 6. When you look at ISG 6 it is set  
3 up with a series of regulatory guidance positions and information needs. And it  
4 lays out at what point in time we need to have those interactions or that  
5 information. So we are looking -- that was the purpose of the workshop was to get  
6 insights and so we could build it in as we are building in ISG 6. And certainly as  
7 we go through with the subsequent review processes, we will have additional  
8 learnings and we can then factor those into ISG 6 as well.

9 COMMISSIONER KLEIN: This is probably a question both for Anne and  
10 Ian. In terms of electromagnetic pulse, the negative impacts and if you get hit with  
11 an electromagnetic pulse, you want to fail in a safe mode.

12 How do you incorporate that in your guidance?

13 MR. RICHARDS: Maybe I can speak to that Commissioner. The Office of  
14 Research has done some looking at that particular aspect. We did it a couple of  
15 years ago and we also have a contract right now with Sandia to look at it. A lot of  
16 the results have to do with the fact that most of these systems are contained within  
17 large concrete structures. So there is some shielding. We are still waiting for the  
18 results to come back. So I guess I shouldn't pre-judge the outcome of that work.  
19 But it is something that we looked into and we recognize that there is a larger  
20 national issue. I think there was a commission that just came out with a report on  
21 that and we are following up on that.

22 COMMISSIONER KLEIN: Ian, in terms of -- you talked about having a

1 peer review group looking at it. Did you have any one from outside the NRC on  
2 that peer review?

3 MR. JUNG: At this point, we have not done an outside review. Several  
4 reviews, including Wolf Creek review, NRO actually looked at it to make sure it is a  
5 first of a kind. That is one of the criteria of the procedure we developed is first of  
6 a kind of issues. NRO has been given a chance to look at it and we made actually  
7 some comments and that resulted in more enhanced safety evaluation report.  
8 Definitely, we can go beyond but right now, given as Bill said, we have a great set  
9 of senior level advisors. Four of those people, we are utilizing them to the extent  
10 we can. That right now, it is providing that internally we are getting sufficient  
11 support getting the peer reviews right now. As we need it, we have Research and  
12 we can go outside. We also have international counterparts to engage them on  
13 getting their input and so we have multiple venues addressing those issues.

14 COMMISSIONER KLEIN: Ian, you also committed on IMDEP in terms of  
15 learning a lot and getting information. Do you take advantage of operational  
16 experience that some of the utilities in other countries have had in your in IMDEP  
17 activities?

18 MR. JUNG: Yes, we hear about lessons learned, some good and some  
19 bad. We recently had a really in-depth discussion with the Taiwan regulators and  
20 we had annual bilateral meetings and they open heartedly shared a lot of lessons,  
21 lot of QA issues, integration issues. Taiwan had 25 different suppliers for I&C  
22 coordination. Those suppliers was an issue, timing was an issue. One vendor

1 finished one, the other vendor has to wait for the other vendor to get their job  
2 done. We are looking at these issues looking forward as we look at our new  
3 reactor QA processes and how they are going to integrate that next week or so.  
4 My staff is going to Toshiba in Japan for their vendor qualification. We will ask  
5 some similar questions about that and how are you going to integrate that? Have  
6 you done that type of work? We constantly hear about the Finland experience.  
7 And there are lessons learned. Some of them resulted in generating RAIs  
8 internally to EPR design, for example. In some cases it is mutual. We had an RAI  
9 related to a potential single failure issue and other countries generated RAIs about  
10 that. So a mutual benefit is ongoing.

11 COMMISSIONER KLEIN: We talked earlier about risk-informed and I know  
12 that ACRS will be speaking this afternoon. Stuart, when do you think we will have  
13 enough data from operating systems to really go for risk-informed?

14 MR, RICHARDS: That's a speculation I can't make. It is a long row to hoe  
15 and I talked to a lot of people about it preparing for today. There is a lot of work  
16 going on and there are some people in the short term who are very pessimistic. If  
17 I could answer why, that might help but, it has to do mostly with the software, a lot  
18 of the software is custom designed for a specific application. We don't have a lot  
19 of experience with nuclear applications of software so when you try to build a  
20 database to risk-inform, can you go out and use examples from other industries?.  
21 Was it put together the same way? Was it applied the same way; because it's so  
22 application specific, you can't always transmit that information from one use to our

1 use.

2 The technology evolves fairly rapidly so if you look at experience from three  
3 or four years ago, is that still applicable today? Or will it be applicable three or four  
4 years down the road? So it is quite a challenge.

5 Talking with the PRA people, I was flat out told that we do not model  
6 software failures today. But that's not to say that we can't do that. We've got a lot  
7 of very smart people working on it. We've got some work underway to bring in  
8 people from around the world literally to talk about that very topic. To give you a  
9 date sir, I can't do that.

10 COMMISSIONER KLEIN: Thanks.

11 MR. MORRIS: Commissioner if I could just address maybe a part of that  
12 question. My name is Scott Morris. I'm the Deputy Director for Reactor Security in  
13 NSIR and I'm also on the Digital I&C committee.

14 Part of the concern about software is not just the software but also how it  
15 interacts with the hardware that it is running on. And to put it in layman's terms,  
16 you can run a Windows XP on an old 286 machine or you can run it on a brand  
17 new Pentium, whatever and the reliability and functionality will be different. So it's  
18 not just the software itself but it's also the dynamic between what hardware  
19 platform you are running the software on. So it adds another whole degree of  
20 complexity to the problem which adds to the challenge of risk informing the  
21 application.

22 So I wanted to throw that in there because I think it is an important element

1 of the discussion. .

2 COMMISSIONER KLEIN: Thanks, appreciates that. One final question. As  
3 we look at Watts Bar 2, are they looking at putting appropriate digital activities in  
4 that one? Because, obviously, if you look at a plant that's already operational, you  
5 have a lot of constraints. But if you look at a plant that's sort of half way between  
6 the old plants and not quite the NR0, and so it would be -- that might be one of  
7 those opportunities and I just wanted to know if they are looking at it.

8 MR. KEMPER: I'm Bill Kemper. I would like to try to answer your question.  
9 The Watts Bar approach is basically they are replicating the system that's already  
10 in operation at Unit 1. So our review really consist of the deltas that exist between  
11 Unit 1 and Unit 2 which is an Eagle 21 system that was licensed 10 years, 15  
12 years ago. So, to answer your question if I can directly, they are not changing the  
13 system hardly at all. That's their approach. They are trying as hard as they can to  
14 maintain a very consistent design from what's already been approved. So it will  
15 simplify the licensing process itself from the licensing standpoint.

16 COMMISSIONER KLEIN: I can understand the consistency but I can also  
17 understand a potential missed opportunity before it goes into operation.

18 MR. KEMPER: In talking with their staff, they have already told us that in all  
19 likelihood after they are licensed they can expect to do some upgrades of the  
20 system.

21 COMMISSIONER KLEIN: Thank you.

22 CHAIRMAN JACZKO: Any more questions? Well, thanks again for a good

1 discussion. For many of the people on this side of the table, we have made a lot  
2 of progress in this area and there are probably areas to continue to improve on but  
3 we seem to be moving into more regular process for digital I&C and that is good  
4 news. So thanks very much.

5 (Whereupon the meeting was concluded)

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