Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Open Session

Docket Number: N/A

Location: Rockville, Maryland

Date: April 6, 2017

Work Order No.: NRC-3009 Pages 1-112

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UNITED STATES NUCLEAR REGULATORY COMMISSION'S ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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642ND MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

OPEN SESSION

+ + + + +

THURSDAY

APRIL 6, 2017

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 1:30 p.m., Dennis C. Bley, Chairman, presiding.

COMMITTEE MEMBERS:

DENNIS C. BLEY, Chairman

MICHAEL L. CORRADINI, Vice Chairman

PETER RICCARDELLA, Member-at-Large

RONALD G. BALLINGER, Member

CHARLES H. BROWN, JR. Member

MARGARET CHU, Member
WALTER L. KIRCHNER, Member
JOSE A. MARCH-LEUBA, Member
DANA A. POWERS, Member
HAROLD B. RAY, Member
JOY REMPE, Member
GORDON R. SKILLMAN, Member
JOHN W. STETKAR, Member
MATTHEW W. SUNSERI, Member

DESIGNATED FEDERAL OFFICIAL:

CHRISTINA ANTONESCU
KENT HOWARD

ALSO PRESENT:

DONALD BRITTNER, NRR
LUIS BETANCOURT, NRO
STEVEN BLOOM, NRR
ANGELA BUFORD, NRR
DAVID CURTIS, NRO
JOE DONOGHUE, NRR
SARAH FIELDS, Public Participant*
ALLEN HISER, NRR
DAWNMATHEWS KALATHIVEETTIL, NRO
BILL ROGERS, NRR

MADHUMITA SIRCAR, RES

OMID TABATABAI, NRO

ANDREA VEIL, Executive Director, ACRS

GEORGE WILSON, NRR

*Present via telephone

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

P R O C E E D I N G S

1:30 p.m.

CHAIRMAN BLEY: The meeting will now come to order. This is the first day of the 642nd meeting of the Advisory Committee on Reactor Safeguards.

Today's meeting the Committee will consider the following. Well, the first two we have already done, which was a meeting with the commissioners.

Three is a NuScale Topical Report, highly integrated protection system platform. Later this afternoon subsequent license renewal and then preparation of ACRS reports.

The ACRS was established by statute and is governed by the Federal Advisory Committee Act, FACA. As such, this meeting is being conducted in accordance with the provisions of FACA.

That means that the Committee can only speak through its published letter reports. We hold meetings to gather information to support our deliberations.

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

That said, we also set aside 10 minute for spur of the moment comments for members of the public attending or listening to our meetings.

Written comments are also welcome. Ms. Christina Antonescu is the designated federal official for the initial portion of the meeting. There she is.

Portions of the session on NuScale Topical Report may be closed in order to discuss and protect information designated as proprietary.

When that happens, we will take public comments at that time. We will finish this meeting and then we will come back in a public session for the next session at 3:15 p.m. later today.

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

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

There is a telephone bridge line to preclude interruption of the meeting. The phone will be placed in a listen-in mode during presentations and Committee discussion.

A transcript of portions of the meeting is

being kept and it is requested that the speakers use one of the microphones, identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

At this time, I will turn the meeting over to Professor Corradini for our first session.

VICE CHAIRMAN CORRADINI: Okay. Thank you very much.

So for the members, this is our Full Committee meeting following our Subcommittee meeting on one of, I think, the second topical report coming out of NuScale.

This topic is a highly integrated protection system platform. This is a topical report which will support the protection, the NuScale design and certification application and all we are considering today is the platform design and associated architecture that will be discussed by the staff.

NuScale should be on the line, okay, and if we have questions of NuScale we can go to the - to the private or should I say the private line into the discussion.

We will plan to have an open session. When we are done with that we will go to public

comments and then we will go to closed session to discuss any issues relative to the design and our questions in closed session that is proprietary.

CHAIRMAN BLEY: Pete.

MEMBER RICCARDELLA: Yeah. I need to recuse myself from any deliberations on this subject.

CHAIRMAN BLEY: Okay. So we will start with Omid Tabatabai. Omid -

MR. TABATABAI: Yes.

CHAIRMAN BLEY: - the floor is yours.

MR. TABATABAI: Thank you. Thank you, Dr. Corradini. Thank you, ACRS members. I think you covered all of the introductory material very well. We have two separate bridge lines.

For the open session, members of the public can ask questions and then once we start the closed session we are going to hang that up and then start the closed bridge line.

It's a separate number and it activates at 1:45. It's not activated right now.

As you mentioned, NuScale technical staff are available online. If there are any questions we will - if we need to we will defer to NuScale staff.

There are two sets of handouts here in front of you. One is for the open and closed, and

then there is a - there is an older size chart and that goes with the closed session. And then for the members of the public, the audience, we will provide the closed session handouts after we close the open portion of the meeting.

As you mentioned, we covered this topic during a Subcommittee presentation back in February and we issued our final safety evaluation report in March.

And today is an opportunity for the Full Committee members to ask questions and give us any comments or suggestions before we finalize our safety evaluation report.

I don't have anything else to cover. I will turn the table to Mr. Dawnmathews and he will start the presentation.

MR. KALATHIVEETTIL: All right. Thank you, Omid. Good afternoon, members. I will be presenting the open session of our presentation today.

So first slide. So with today's agenda we will provide a brief background of the major milestones during the review, a high-level description of the HIPS platform, the scope of the staff's review and evaluation and a summary of the staff's regulatory findings.

There is also a slide, slide number eight on the presentation, which has all the acronyms listed. All right. A little bit about the background. In late 2015, the applicant submitted Revision 0 of the topical report. In February 2016, the staff docketed the initial version of the topical report.

Since then, the staff has expended over 15,000 - I am sorry, 1,500 staff hours which involve four engineers. The actual hours are consistent with the estimated hours found in the acceptance letter.

During this time, the staff conducted several public meetings and two audits in support of the topical review. The first audit was here in Rockwell and it focused on reviewing the requirements specs of the platform.

The applicant responded to over 18 staff questions in one round of RAIs. In November 2016, the applicant submitted Revision 1 of the topical report in which the applicant incorporated the responses to the staff's RAIs.

The second audit was at Wimborne, United Kingdom and it was to observe the factory acceptance testing of the platform prototype. The staff confirmed that the claims in the topical report

conformed to the applicable regulations and standards. Also the staff had no new observations nor identified any new RAIs in this audit.

So in January 2017 we shared the draft evaluation and the final IC was published in March of 2017.

MEMBER SKILLMAN: Dawnmathews, is there any location in the world or in the U.K. where this exact system is being utilized?

MR. BETANCOURT: No, this is still in the -

VICE CHAIRMAN CORRADINI: You have to identify yourself, please.

MR. BETANCOURT: Oh, sorry. So my name is Luis Betancourt. To answer your question, no. This is still a design. The only thing that NuScale has done is to build a prototype.

So we expect this will be the first design that will be used by the NuScale application.

MEMBER SKILLMAN: Thank you. Okay.

MEMBER KIRCHNER: May I chime in on this? I should have asked this is Subcommittee for clarification. Is it the objective to essentially confirm this design as we see it or the actual hardware as they built in a prototype or what I am

struggling with, the word platform. So how do you define platform here? Is it the actual architecture of this design and the components that they would use?

MR. BETANCOURT: It is - if I can answer the question.

MEMBER KIRCHNER: Yes, please.

MR. BETANCOURT: It is only the design of the platform. The platform has not been built yet so the only thing that we have here is a philosophy in the way that if you build the platform this way then that will be acceptable to the staff.

MEMBER KIRCHNER: So - and the prototype is in the reports then - of a loaded module is just a prototype?

MR. BETANCOURT: Well, right now we have to do the prototype. But after the prototype they are going to refine the requirements and that's going to be given to us in the design notification and we are going to review that again to see how the prototype went in the final design of the platform.

VICE CHAIRMAN CORRADINI: So just one thing. We are hearing background noise from the phone line. So if you're on the phone line can you please mute your phone? Thank you.

MR. BETANCOURT: As a follow-up, if I want

to say something, if we reach out to -- if you look at the title of the platform, it did not have the designer. So we asked NuScale to add that because this is still a design paper. It hasn't been built yet.

MEMBER BROWN: So let me - let me take a shot at something here. Platform versus architecture - that's Walt's question.

MEMBER KIRCHNER: Yeah.

MEMBER BROWN: The platform is the computing box.

MR. BETANCOURT: Yeah. The brains.

MEMBER BROWN: The SFMs - the safety function module, the safety data - well, no, safety - what is the SDB, what -

(Simultaneous speaking.)

MEMBER BROWN: They safetied that data bus in the scheduling and building module, okay, and the EIM, the equipment interface module.

MR. BETANCOURT: Right.

MEMBER BROWN: Those are - it's the platform. That is not an architecture. That is literally just the boxes in which you build the architecture.

MR. BETANCOURT: Right.

MEMBER BROWN: That's the question he's asking.

MR. BETANCOURT: Right. Okay.

MEMBER KIRCHNER: So when you have approved this, the SER on this Topical, then what you really have approved is those modules in this configuration.

MR. BETANCOURT: Right. In the example proposed in the Topical, right. But then, do people feel you're --

MEMBER KIRCHNER: But as - but as my fellow member corrects me, this is not the architecture -

MR. BETANCOURT: Right.

MEMBER KIRCHNER: - for a bigger system. It's just this building block set.

MR. BETANCOURT: Right. And in the topical report you will also find a statement that you can configure these models in different ways. So in reality they propose to us on a sample of a proposed architecture. But in reality, when they can reference this they can propose on another one and then we will take a look at that again once that -- and the license amendment request was part of the disagreement.

MEMBER MARCH-LEUBA: So going back a step

- a step back, what is the value of the SER? I mean, an SER gets issued so it can be referenced for licensing purposes. Is this SER ever going to be referenced?

MR. BETANCOURT: Yeah. In the design package that's what they want to do. This is kind of the same thing that happened at the electrical - at the classification of the Class 1 report.

They wanted to come to the staff early in the game to find out whether this design will be good for us and that was the reason that we have the topical report in house.

In reality, they could have waited all the way to the design certification to come with the platform. But they just wanted to see that - they want to have the staff to look at ahead of time. That is all.

MEMBER BROWN: Let me phrase that slightly different. All they are going to get out of this is that those modules in a configuration in the chassis can be configured to produce a trip system and safeguards path that meet independence redundancy, et cetera - the fundamentals. That's all they are getting out of this.

It doesn't define the architecture we will

have in the final design. It doesn't cover any connections to any safety/nonsafety connections. It doesn't connect - doesn't talk about communications to the main control room, network interfaces, security blocks, fire walls, one-way data transmit - doesn't talk about any of - other than within those boxes themselves.

That's all, and they could make this six channels. They could make it three or two, whether we would accept - whether it's acceptable and relevant. It's just that those boxes can be put together in a manner that suit the fundamentals.

MEMBER KIRCHNER: In this configuration.

MEMBER BROWN: In this configuration.

MEMBER KIRCHNER: So they would -

MEMBER BROWN: And the - let me finish - and the field programmable data raise can be put together in a manner that is independent as well.

MEMBER STETKAR: Just remember that -

MEMBER BROWN: Go ahead, John.

MEMBER STETKAR: - that in a topical report, John's reactor can use this topical report is John's reactor wants to use this platform. So that helps the staff's review of John's reactor and that the staff doesn't need to review this part of the

platform. You need to review the application specific, you know, to John's reactor.

So when you say just because this happens to have the word NuScale on it it's the staff's acceptance of this part of a conceptual design.

MR. BETANCOURT: Right. And I think at the last meeting you mentioned, John, that a good way to see this, to do this for NuScale, think about it like Rock Creek came from the design. Right.

MEMBER STETKAR: And that's why I used this motion of John - if John's reactor wanted to use this platform as part of our My Safety system.

MEMBER KIRCHNER: Now, is this generic enough at a component level that - because, you know, the short - how much the electronics field changes they could change out individual subcomponents in this architecture?

MR. BETANCOURT: If they changed anything from the modules then we have to take a look at that one.

MEMBER KIRCHNER: Then you'd have to do it. So they are kind of locking in on these modules as defined in this report.

MR. BETANCOURT: Right.

MEMBER KIRCHNER: Okay. So I just wanted

to be clear what exactly you're approving here.

MR. BETANCOURT: Right. And that was one of the reasons -

MEMBER KIRCHNER: Thank you.

MR. BETANCOURT: - that we have a - an ASI, the data departure from the models -

MEMBER KIRCHNER: Okay. Fine.

MR. BETANCOURT: - then it comes back to us.

MEMBER KIRCHNER: Thank you.

MR. BETANCOURT: Shall we move on? Go ahead.

MR. KALATHIVEETTIL: All right. Moving on. The HIPS platform, that's basically composed of logic implemented using discrete logic and FPGA technology. The platform consists of the HIPS chassis which includes a back plane and a back panel and also a system of modules that are interchangeable between chassis.

The different module types can be seen on the slide. The platform is designed to work with different module types configured to individual applications where multiple chassis can be connected together to create a larger system.

The different HIPS modules and platform

inputs and outputs are then connected to each other through the back plane and the back panel of the chassis. The purpose of the SFM is to provide signal conditioning and actuation determination for safety functions.

It also provides scaled value of input processes through nonsafety controls and other safety displays for monitoring purposes. This module includes an FPGA as well as analog components in it. The purpose of the CM is to control -

MEMBER BROWN: Before you - before you go on, the safety function module in this design is the meat and potatoes part. That's where the algorithms for your reactor trip or safeguards actuations are generated.

So they take the plant parameter data, process it through the - in there where the set points are contained and they produce a trip and all that's then passed on via these digital data busses down through the remaining communication modules.

MEMBER STETKAR: Charlie, for clarification, the SFM only determines whether the input satisfies an algorithm that says it is a - I'll use the term - I don't want to use the term tripper actuate.

It is a not acceptable value. It has nothing to do with reactor tripper safeguards actuations. Is that true? Because that's determined down in the SVMs.

MEMBER BROWN: The SVM votes.

MEMBER STETKAR: But there are -

MEMBER BROWN: And it doesn't trip.

MEMBER STETKAR: Well, if this is proprietary we have to be careful. It's we are getting -

(Simultaneous speaking.)

But on the - on the public stuff we have to be careful that the SFMs, I don't believe, know whether their output has anything to do with the reactor trip or safeguards actuation.

MEMBER BROWN: Yes, it does.

MEMBER STETKAR: Do they?

MR. KALATHIVEETTIL: It just determines if you need a trip or -

MEMBER STETKAR: It - don't use the word trip because some people use the word trip as synonymous with reactor trip. Use some other word like - you'd say meets a protection system criterion or something like that.

MR. BETANCOURT: We call that a channel

drip and then we have two channels to a unit.

MEMBER STETKAR: Some people use the term trip interchangeably with the words reactor trip.

MR. BETANCOURT: They are incorrect.

MEMBER STETKAR: It exceeds a set point.

MEMBER BROWN: It exceeds a set point. That's a better way of phrasing it. It determines whether it sees a set point or not and it passes that information on.

VICE CHAIRMAN CORRADINI: I think the members have had enough fun. Let's go.

MR. KALATHIVEETTIL: So as I was saying, the CM is to control, collect and transmit information between other HIPS modules and/or external components from the platform. This module includes an FPGA as well as analog components.

The purpose of the EIM is to provide final equipment actuation output. This module includes analog priorities logic circuitry on the board used for automatic and manual actuation inputs.

This module as well includes FPGA and analog components. The hardware module is used to convert hardwired contact inputs into logic-level signals to make them available on the back plane of the chassis and its platform.

This module, however, only has analog components.

All right. Scope of the review. The scope of the staff's evaluation was a top-down review approach as based on the fundamental I&C design principles of independence, redundancy, predictability and repeatability and, finally, diversity and defense in depth.

These principles are outlined in the DSRs for NuScale. This is the first time that the staff used NuScale DSR's Chapter 7 to perform a review of the topical report.

The design principles apply regardless of the technology. These principles work hand in hand to ensure that the safety functions will be accomplished when needed. That is, that a design should demonstrate compliance with all of them and not one versus another one.

We also spent quite some time reviewing the platform capabilities on calibration, testing and diagnostics. The HIPS platform includes features to detect and monitor the system's performance during operation and to initiate alarms if the system fails to perform deterministically and within the required time frame.

Regulatory conformance - the staff finds that the HIPS platform design supports meeting the applicable regulatory requirements associated with the fundamental I&C design principles.

The scope of the staff's review also had 65 ASAIs which have been established of which 55 are proposed by the applicant and the staff added an additional 10 of them to the list. The staff review does not address quality assurance nor equipment qualification because these are application-specific activities that depend on the equipment vendor used to implement the HIPS platform.

For those two aspects, the staff has established ASAIs, which are application-specific action items, for the users of this platform to demonstrate that the HIPS platform QA processes is complying with 10 CFR Appendix B and that the equipment is qualified with the applicable EQ requirements.

The staff was also able to review the provisions for secure development in operational environment, SDOE, at the platform level.

However, for the system level aspects of SDOE the staff has established ASAIs to demonstrate compliance with IEEE 603 clause 5.9.

The MWS, which is the maintenance work station, and the PS, which is the protection system, is already included to support the discussion on monitoring indication testing and calibration.

That's pretty much what I have for the open portion. So if you have any questions?

VICE CHAIRMAN CORRADINI: Do members have any other further questions? I am sorry. John?

MEMBER STETKAR: I have one. One of the - we had some discussion about - a little bit - in the Subcommittee.

There is one of the ASAIs that says - it's number 21 if you want to look it up in Table 4-1 - an applicant or licensee referencing this SC must provide redundant power sources to separately supply the redundant power conversion features within the HIPS platform.

We had some discussion about what the staff's intent with the word redundant was in a licensing situation and those words haven't changed. Apparently, you decided there wasn't any need for any further clarification of that.

MR. BETANCOURT: That's correct.

MEMBER STETKAR: And in the closed session we can get into more details about different

interpretations of redundant. You looked at it and you decided no further clarification was needed.

MR. BETANCOURT: Right. At this time. Right.

MEMBER STETKAR: Okay. Thank you.

VICE CHAIRMAN CORRADINI: Other questions from the members? Okay. What I want to do now is I want to go to the - ask if anybody in the - in the - here in the room wants to make a public comment and can we please have the phone line open so that if there is somebody on the phone line can make a public comment. We seem to have a --

Thank you. Is anybody on the phone line? Please acknowledge that you're there. Anyone?

MS. FIELDS: Yes.

VICE CHAIRMAN CORRADINI: Okay. Is that - if you'd please identify yourself and give us your comment.

MS. FIELDS: This is Sara Fields with Uranium Watch in Utah. I did have a question of how the approval of these various topical reports, which in fact are generic, how they fit into the approval - the overall design rule making approval specifically for NuScale. Is this part of the - I mean, how does that work? I mean -

VICE CHAIRMAN CORRADINI: So - so let me - let me try to not answer your question directly but give you the resource.

So Ms. Christina Antonescu from our staff, you can communicate with her and she can get to your question. We really take comments on the record now, not questions. We will answer the question appropriately after the fact and then you can get copies of the view graphs. Does that help you?

MS. FIELDS: Thank you.

VICE CHAIRMAN CORRADINI: You're welcome. Is anybody else on the public line that wants to make a comment?

Okay. Hearing no one else, can we please close the public line? Close the public line completely. Let's go to closed session. I'd ask staff and NuScale to please look in the room.

Make sure everybody in the room is either from NuScale or they are associated contractors or NRC and their associated contractors.

(Whereupon, the above-entitled matter went off the record at 1:55 p.m. and resumed at 3:14 p.m.)

CHAIRMAN BLEY: The meeting will come to order. At this time I will turn it over to Mr. Skillman to lead us through the subsequent license

renewal presentation.

MEMBER SKILLMAN: Mr. Chairman, sir, thank you.

Ladies and gentlemen, today we are here to talk about subsequent license renewal. To date 87 plants in this country have had their licenses renewed using a currently understood license renewal process. Within the next 24 months the NRC will receive two applications from two applicants that will apply to extend from 60 to 80 years licenses for those plants, and it's conceivable that over the course of the next 5 or 6 years there may be as many as 7 more plants applying for this renewal. That is for 20 on top of 60.

And so we are here to talk about life beyond 60, subsequent license renewal, and the processes that the DLR has created and the documents DLR has created for this process. And for this, I will call on George Wilson to please lead us through the process.

MR. WILSON: Thank you and good afternoon. I am George Wilson, the Director of the NRR's Division of License Renewal. Beside me is Joe Donoghue, my deputy, who just started Monday.

We met with the ACRS Subcommittee on

License Renewal three weeks ago. The meeting went to Subcommittee focused on the changes we made from our draft Subsequent License Renewal Guidance published for public comment for the final guidance document step we are proposing for publication in July.

The meeting today will focus on the final Subsequent License Renewal Guidance Documents. These draft guidance documents include the Generic Aging Lessons Learned for Subsequent License Renewal, being called GALL-SLR. The Standard Review Plan for Review of Subsequent License Renewal for Nuclear Power Plants, which we will now call SRP-SLR. And as I stated earlier, we plan on publishing these documents in July.

Today we will also brief you on an effort within the division to evaluate the subsequent license renewal application review process and develop recommendations on how to make this process more efficient and effective.

I'll now turn the presentation over to Steve Bloom.

MR. BLOOM: Thank you, George, and thank you to the members of the ACRS Committee. As he said, my name is Steve Bloom. I'm the Branch Chief in charge of the Subsequent Renewal Guidance And

Operations Branch in the Division of License Renewal in the Office of Nuclear Reactor Regulation.

Today Dr. Allen Hiser will brief you on development of our Subsequent License Renewal Guidance Documents and the most significant technical changes in our guidance documents from those that were in the guidance documents which were for the initial license renewal. Then Billy Rogers will discuss this optimization of the SLR application review process.

As I previously discussed with Mr. Skillman, we look forward to receiving the letter after this meeting and/or in the near term.

I now turn over to Dr. Hiser.

DR. HISER: Good afternoon. Before discussing the guidance documents for subsequent license renewal I will provide a brief background on how we've arrived to this point with the final documents for SLR.

In the first bullet, the governing regulation for license renewal is Part 54 of Title 10 of the Code of Federal Regulations, the License Renewal Rule. With most plants having received their new licenses to operate from 40 to 60, the question of extending licenses to 80 years was raised by industry about a decade ago. This is actually contemplated in

Part 54. Part 54.31(d) states that a renewed license can be subsequently renewed and it doesn't give a limit. So it just says you can renew, subsequently renew licenses.

Beginning in 2011 the staff began to consider the review that would be appropriate for subsequent license renewal application and proposed several options for changes to the License Renewal Rule in a paper to the Commission in 2014. Although the Commission did not approve the staff's proposal for rulemaking, the Commission in part directed the staff to address some merging technical issues in operating experience through, in part, updates to the License Renewal Guidance Documents.

In December of 2015 the staff issued for public comment the draft Guidance Documents for SLR, as George Wilson mentioned, the GALL-SLR and SRP-SLR. The public comment period ended in February 2016. Since that point the staff has been reviewing public comments. We have held numerous public meetings and we've worked to develop the final guidance documents we are here to discuss today. At this point these final guidance documents are ready for issuance.

Next slide. Now, the Commission SRM regarding the staff paper on rulemaking proposals for

the Part 54 directed the staff to keep the Commission informed on the progress in resolving several technical issues related to subsequent license renewal, specifically the four items that are listed on this slide. I will speak more on how we have dealt with these issues in the guidance documents over the next few slides.

Overall, industry is responsible for developing the technical basis to demonstrate the aging effects for these issues and other technical issues will be managed for subsequent license renewal. For those aspects of these technical issues that are not fully resolved on a generic basis, applicants for subsequent license renewal will need to address these issues on a plant-specific basis.

Next slide. Now, ACRS reviews have been a very important part of the staff's work in subsequent license renewal going back to early 2014 just after issuance of the Commission paper by the staff. This interaction has included both Sub and Full Committee meetings, and one meeting about a year-and-a-half ago addressed the status of research on the subsequent license renewal technical issues that were identified by the Commission.

Next slide. Dating back to the original

issuance of the License Renewal Rule in 1991, the NRC identified several key principles for license renewal that underpin the adequacy of the regulatory framework for license renewal.

The first one is that the regulatory process, the current ongoing regulatory process ensures that the current licensing basis for each plant provides and maintains an adequate level of safety. There's one caveat to that: except for the effects of aging on long-lived passive systems structures and components.

In addition, each plant's licensing basis must be maintained during the license renewal operating period, as it has been throughout all of plant operation. Now, the one main provision again is that there's additional focus on management of aging effects of in-scope passive long-lived structures and components.

Next slide. For the subsequent license renewal operating period existing regulations and processes ensure plant operation. First the process that's laid out in the License Renewal Rule ensures that passive long-lived structures and components will continue to perform their intended functions during the subsequent period of extended operation.

In addition, the process that's laid out in Part 54 for the review of subsequent license renewal applications has a thorough review that includes both environmental and safety reviews and use of audits. Throughout all of plant operation there's continuous verification of plant safety through reviews by the NRC and through the implementation of the reactor oversight process.

Next slide. Now, to implement subsequent license renewal the staff has developed two main guidance documents: the GALL-SLR and the SRP-SLR, as mentioned by George earlier. These documents parallel similar documents that we developed for license renewal. The main difference is that the SLR documents are applicable for aging from 60 to 80 years, whereas the license renewal documents were for 40 to 60 years.

Now, the GALL-SLR as in -- similar to the GALL report, provides a generic evaluation of aging effects that need to be managed and provides appropriate generic aging management programs to do this aging. Now, plants are always free to propose their own alternatives, but they have to have sufficient justification for those, and they will be reviewed by the staff on a detailed basis. Now, well

the GALL-SLR report document is geared towards use by applicants, the SRP-SLR provides guidance to the staff for its review of subsequent license renewal applications.

Next slide. Now, in order for plants to operate for 60 to 80 years, or during the subsequent period of extended operation, we need to determine the aging effects that could occur during the operating period out to 80 years. Now, this conclude no mechanisms that are found in new locations or are found to be more severe than previously identified possibly due to exceeding incubation times or activation energies that govern the mechanism. Further, there may be new phenomenon that induce aging. And these are an additional concern for us.

Now, because we only have plant operation that extends to less than 50 years, we can't utilize operating experience alone to determine the aging issues that we will need to -- the plants will need to manage for 80 years. So we needed to use some additional information sources.

Now, to do this we formed subsequent license renewal expert panels from staff in the Office of Nuclear Reactor Regulation and the Office of Nuclear Regulatory Research beginning in about 2014.

These panels reviewed and deliberated on information that was provided from various sources.

The first item listed on the top there was that we reviewed the information from the Expanded Materials Degradation Assessment in which NRC, industry and international experts identified the areas that were believed to be the most challenging for subsequent license renewal.

In addition, we reviewed reports from audits that we performed at several plants that had operated for several years into the period of extended operation. These audits were intended to qualitative assess the effectiveness of the implementation and to identify any unexpected aging phenomena that the plants had found during their inspections.

These audits reviewed all of the AMPs implemented at the plants including those implemented on a one-time basis that are used to ensure effectiveness of preventive programs such as water chemistry programs, as well as AMPs that are implemented on a periodic recurring basis. In addition, we reviewed operating experience from both domestic and international plants. And finally, we considered comments that we collected during public meetings on SLR, as well as comments from the staff.

Next slide. In the next several slides I will describe some of the refinements in the GALL-SLR and the SRP-SLR as compared to Revision 2 versions of the GALL and SRP that we use for license renewal. This is a little bit different from the Subcommittee meeting where we focused on the differences between the four comment versions of the reports and then the final version. So this is a little more expansive.

Two new aging management programs are included in the GALL-SLR report. One program that addresses fluence monitoring of the reactor pressure vessel and the reactor vessel internals as applied to both time-limited aging analyses and aging management review for the vessel and internals. This new program provides a consistent generic approach for existing plant programs that are used to monitor neutron fluence.

In addition, a new program to manage aging of high-voltage insulators is included in the GALL-SLR report. Previously these insulators were addressed in license renewal as a further evaluation item, but the inclusion of the new AMP provides a generic aging management approach in lieu of the previous treatment on a plant-specific basis by each individual applicant. This new AMP is an example of our use of

lessons learned from review of prior applications to improve the efficiency of the applicant's development of its subsequent license renewal application and also the staff's review of the application.

Aging management for reactor vessel internals of PWR, or pressurized water reactors, is a challenging area. The aging management program for the license renewal period in the GALL report utilizes as its basis an industry report that addressed conditions for license renewal at 60 years of operation. This program uses a sampling approach to inspect the components that are the leading indicators for degradation; for example, those that maybe have the highest neutron fluence or stress levels.

In the absence of a similar review to address the conditions relevant to 80 years of operation as needed for subsequent license renewal, which the industry has indicated it will submit in 2020, the aging management program and the GALL-SLR report state that applicants may use their existing program for 60 years as long as they supplement the program with gap analysis to identify the additional aging management activities, if any, that would be necessary to ensure adequate aging management for 80 years.

The Reactor Vessel Surveillance Program is intended to give an early indication of the embrittlement trends for the reactor vessel due to neutron irradiation and to ensure that the plant is operated with appropriate safety margins against vessel failure. The guidance for subsequent license renewal states that plants should test the surveillance capsule which bounds the expected neutron fluence for 80 years. This capsule may have been tested previously by the plant. It may be a capsule that is currently scheduled for testing at an adequate neutron fluence under the plant's current renewed license or it may be a standby capsule that is designated for testing at a sufficiently high neutron fluence.

However, the guidance also notes that it is not acceptable to redirect or postpone the withdrawal and testing of a surveillance capsule intended for license renewal in order to achieve a higher neutron fluence needed for subsequent license renewal. The next slide will illustrate this note.

Next slide. Now, illustrated are the surveillance capsule statuses for two plants for the license renewal period up to 60 years. Now, for each figure the X axis is the date, either when the plant

started or when the plant will exceed 60 or 80 years of operation, and the Y axis is the neutron fluence. So the vertical lines and horizontal lines indicate the dates and approximate fluence levels, respectively, for 60 and 80 years of plant operations in blue and orange, respectively.

So for example, for 60 years the plant on the left the neutron fluence that would be of interest for the vessel is a little bit less than 6 times 10 to the 19th neutrons per centimeter squared. For 80 years of operation it would be about 7.5 times 10 to the 19th.

Now, the filled circles on each figure indicate the withdrawal date and neutron fluence level for the capsules that each plant has tested. For the license renewal period of 60 years at least one data point is desired to be above the blue horizontal line. For the SLR operating period of 80 years at least one data point should be above the orange fluence line.

MEMBER MARCH-LEUBA: I don't understand the figure. Let me see if I -- the horizontal line is the average fluence for the whole vessel and the black dot is the fluence for the sample, which is higher?

DR. HISER: Yes.

MEMBER MARCH-LEUBA: Because -- that's

what it is?

DR. HISER: Yes. Yes, the --

MEMBER MARCH-LEUBA: Okay. So the samples are receiving higher fluence than the rest of the vessel?

DR. HISER: The samples are located inside of the vessel, so they may be in capsules that are attached to the wall, they may be on the thermal shield.

MEMBER MARCH-LEUBA: So the sample that they received on the left one at 2010 is equivalent to 2030 when the 60-year life --

DR. HISER: That's correct.

MEMBER MARCH-LEUBA: I understand. I understand.

DR. HISER: Yes, so the lead factor for that capsule would be about 1.5.

MEMBER KIRCHNER: But for SLR they'd have to test one more capsule, right?

DR. HISER: Right. And so for the plant on the left --

MEMBER KIRCHNER: Yes.

DR. HISER: -- you can see the five data points. They're fairly well spaced both in fluence and time. So that was a very well organized program.

MEMBER KIRCHNER: But it assumes that they have another capsule in there?

DR. HISER: Right, this plant also has a capsule. So it has one. It's still in the vessel and the plant has stated that they will withdraw that capsule when it exceeds the fluence for 80 years. So they will put that in storage. If they choose to come in for subsequent license renewal, then they will go ahead and test that capsule.

MEMBER MARCH-LEUBA: And Plant B, why did the fluence went down? They move the sample?

DR. HISER: The capsules are located in different locations.

MEMBER MARCH-LEUBA: But it's not the same capsule? Okay.

DR. HISER: Right. Yes, so it had a different lead factor. In the case of Plant B, four capsules have been tested. The fifth capsule was actually in the renewed license. They were allowed to delay withdrawal of that capsule until it achieved a fluence equivalent to the 60-year fluence, or that exceeds the 60-year fluence. So the one provision in the program for SLR is that that plant could not continue to take that point and push it out further.

In this case we believe that the fluence

gap between the data that's available now and say going out to 80 years would just be too much. We need -- they need to have a data point. So that 60-year capsule will be tested in -- I don't know, that's maybe about 2025, something like that. So in about eight years they will have the data for 60 years.

This plant then also has three other untested capsules. They lead factor is not as high as for Plant A, so they will need to remain the vessel longer to get the 80-year fluence. But we would expect that if this plant comes in for subsequent license renewal that they would propose to withdraw one of those capsules to achieve that fluence and generate the data that they need.

Okay. Next slide. Now one program on aging management of electrical cables that are inaccessible, that are underground and not subject to environmental qualification requirements, was expanded into three AMPs to address aging of submerged cables at different voltages. And this would include low and medium voltages along with instrument and control cables. This change was made to address the differences in both the aging effects and testing for the three types of cables.

For concrete we have made changes to the

guidance to address aging management of alkali-silica reaction, which you may have heard about, and also irradiation of concrete, both of which are covered by further evaluations that require plant-specific attention in the GALL as are actually in I guess in the SRP-SLR document. For alkali-silica reaction the further evaluation identified in Revision 2 of the GALL report for license renewal was updated to include recent operating experience.

A new further evaluation on irradiation of concrete provides a means for applicants to identify plant-specific conditions that would indicate either a need for aging management or would provide a technical basis for concluding that irradiation of concrete is not a relevant aging issue for the plant.

MEMBER POWERS: What are you looking for there?

DR. HISER: What are we looking for?

MEMBER POWERS: Yes.

DR. HISER: I think maybe I will phone a friend in the audience.

(Laughter.)

DR. HISER: Angie, can you -- yes, maybe Angie can speak to that.

MS. BUFORD: This is Angie Buford with

staff. The irradiated concrete further evaluation is looking at the fluence and how much fluence gets to the concrete and then the plant will have a plant-specific analysis to identify whether there is degradation that would impact the structural intended function for the bio-shield area and also for the support for the vessel depending on the layout of the plant.

MEMBER POWERS: Well, I'm struggling to understand what radiation damage could occur.

MS. BUFORD: I couldn't hear that question.

MEMBER POWERS: I'm struggling to understand what radiation damage could occur in the concrete that would lead to substantial structural degradation.

MS. BUFORD: Well, the neutron and gamma radiation has an effect on the aggregates, potentially an expansive effect that is currently undergoing research in both NRC confirmatory research and also in industry to determine what effect on the strength capacity that expansion in the aggregates would have.

MEMBER POWERS: That's for sure true that your irradiation, especially your radiation is going to do -- cause atomic displacements with almost ipso

facto mean an expansion. Do you really think you get into a regime where that would be enough to -- I mean, the pour structure of the concrete is fairly forgiving.

MS. BUFORD: What was the question? I'm sorry.

MEMBER POWERS: Do you really think that you get enough expansion of the aggregate to overwhelm the plasticity --

MS. BUFORD: The crystalline structure?

MEMBER POWERS: -- of the gel water?

MS. BUFORD: And that's a question that's under research right now. The research just isn't far along enough to know --

MEMBER POWERS: Who's doing that?

MS. BUFORD: EPRI. I would probably want industry just to make sure that they agree with me, but I believe EPRI is undergoing research. Various -- NEI is sponsoring research and so is DoE. We have -- there's a joint consortium of NRC, DoE, EPRI and NEI that meets regularly to discuss who's doing what in terms of the research, but right now there's just not enough research to conclude that there is -- how much fluence actually gets to the concrete. And then once we determine how much fluence gets to the concrete,

then you need to analyze to determine whether your -- a limiting stress area -- whether that -- the expansion in the aggregate would even matter.

So the research is not far along enough yet, which is why in the GALL -- the SRP-SLR there's a further evaluation that we plan -- are going to have to perform a plant-specific analysis to look into this.

MEMBER POWERS: I'm just not sure what they would analyze for.

DR. HISER: Well, there is available data that indicates that the performance of the concrete degrades as you irradiate it to higher fluences.

MS. BUFORD: Well, yes, but there -- but right now there's not enough data to understand how much fluence the concrete is actually seeing. So if it's 10 to the -- 1 times 10 to the 19th, is that much actually getting to the concrete? And if it is, does that affect the strength or intended function of the concrete?

And also what are the limiting areas of concern? Is it right outside the belt line where maybe the -- maybe it's not of concern there. Maybe it's there's more of a concern for support structures, which would see less fluence, and depending on the

configuration of the plant. So that's why right now it's really a plant-specific analysis to even determine whether it's an issue. We have enough understanding right now that we don't believe for BWRs that this would be a concern. Right now it's the really the two-loop, three-loop plants that are really engaging in most of the research.

MEMBER POWERS: I would think the biggest concern would be activation in the aggregate. I think -- I mean, cobalt-60.

MS. SIRCAR: Yes, can I add a few words to Angie? Already there is some scoping -- oh, sorry. I'm Madhumita Sircar and I work in Office of Research and supporting NRR DLR, this particular topic of research.

We -- as Angie correctly mentioned that there is a joint road map between -- among NRC, EPRI And DoE. The initial scoping study says that the concrete start degrading at the fluence level of 1 into 10 to the 19, energy level 0.1 MeV and higher. And fluence -- estimated fluence for 80 years is more than 6 into 10 to the 19.

Current knowledge is very old, which is from '70s, and also not very relevant to LWSR plants. So with that knowledge there's a huge knowledge gap

and the earlier knowledge shows that from 20 into 10 to the 19, or even before that, the concrete compressive strength, the side strength, the modulus, modulus of elasticity degrades. And there is also the effect of gamma and thermal. And this expands. The interfacial zone between the aggregates and cement gets affected. Cement paste cracks because of moisture transportation, temperature accumulates. So all these things are there and it's already established that concrete starts degrading after one into 10 to the 19 and the expected fluence is 6 into 10 to the 19, energy level 0.1 MeV.

DoE is doing the material degradation study and EPRI is doing the more applied side of it, How the structural significance will be, and NRC is doing the confirmatory study. And if there is a need for collaboration that will expedite the process, NRC is also part of that.

DR. HISER: And one of the reasons this is further evaluation for each plant to evaluate is that the conditions vary in each plant. And so they need to do their own fluence calculations to understand the fluence that would be on their concrete.

MS. BUFORD: Yes, I just wanted to highlight that. Right now they're still determining

whether the concrete itself would see that fluence.

MEMBER POWERS: I would think --

(Simultaneous speaking.)

MS. SIRCAR: -- see that because there is no question about it. The concrete is going to see 1 -- 6 into 10 to the 19 energy level greater than 0.1 MeV. And the degradation threshold is by the exports in this field they have fixed that threshold value as 1 into 10 to the 19th. So it's much higher than that degradation starting point. And most all BWR plants will see that much earlier than 80 years.

MEMBER POWERS: I would think that --

MS. SIRCAR: But the layout and the overall aspect, if we consider, probably some plants may be excluded and EPRI is doing that study. So the plants that will be mostly affected are Westinghouse two-loops and three-loops and particular type of structure which has two types of support under the nozzles directly on the sheet 1.

And the other aspect is concrete constitution. Like what kind of aggregate is being used in that concrete is very important. Not all aggregates are susceptible to that. So it's a combination of many factors, and research is ongoing.

DR. HISER: Okay.

MEMBER POWERS: Thank you.

DR. HISER: Next slide. Now we've -- most of the changes I talked about on the prior two slides related to the GALL report. I just wanted to hit some of the changes to the SRP. As we've talked a little bit about further evaluations we've been able to eliminate some of the plant-specific further evaluations which require substantial applicant resources and also staff review resources so that they point to a generic AMP to manage the aging effects.

So this takes a further evaluation, plant-specific item to something that's consistent with GALL. And so it's a much easier review by the staff. And that would be based on having reviewed these items for multiple plants and having find the generic AMP to be acceptable.

For the second item the staff has identified AMR -- or has added AMR items, aging management review line items to the GALL-SLR that we previously found to be acceptable in multiple application reviews. This enables plants to identify items that's consistent with GALL, thereby reducing their burden in justifying an item that would otherwise not be consistent. And it also reduces the staff's review burden.

With an SRP-SLR we broadened Section 4.3 on metal fatigue to provide guidance in other areas such as flaw growth analyses that applicants may have.

MEMBER POWERS: So as what?

DR. HISER: Flaw growth analyses that may have an aging effect associated with those. Stress corrosion cracking, fatigue or may have irradiation effects on the material properties.

Finally, in Section 4.7 of the SRP-SLR we've added a table to list common plant-specific time-limited aging analyses. These would be things like leak before break that many plants have. And also crane fatigue would be a couple of examples.

Next slide. Now we've also added a new chapter on technical specification changes and additions to the SRP-SLR. And this would be any change to the tech specs or additions that are needed to address aging management. Examples on this would be testing requirements for fuel oil used for emergency diesel fuel storage tanks that may be in the tech specs. If they need to be changed because of the AMP for diesel fuel oil, then that would have to be addressed by the applicant and reviewed by the staff. And also pressure temperature limits for the reactor pressure vessel. If they're in the tech specs, that

would require a tech spec change, potentially.

In addition, we've added a new Appendix A.4 to the SRP-SLR which provides more detail on the use of operating experience to maintain the plant's aging management programs as true living programs.

MEMBER POWERS: Future operating.

DR. HISER: Future. Yes. So this is intended to highlight the use of aging management as a threshold for future evaluation of both plant-specific and industry operating experience and describes periodic assessments of the effectiveness of AMPs as an important element of maintaining the aging management programs. In addition, we've added more detailed summary descriptions for the final safety analyses report SLR supplement. So this would be for AMPs, for TLAAs, for example.

Next slide. The guidance documents for subsequent license renewal provided means for applicants to develop adequate programs and for the staff to review subsequent license renewal applications. Most of the relevant aging issues are addressed by generic aging management programs as we've discussed the last few slides. For a few remaining issues the guidance documents identify further evaluations for the applicants to identify and

justify their plant-specific proposals to manage the aging effects.

In all cases applicants have the responsibility to ensure that they've identified the relevant aging issues for their plants, appropriate aging management activities and adequate justification for their programs. With the completion and issuance of these guidance documents NRC is prepared to review subsequent license renewal applications.

Next slide. Now, this slide just provides an overview of the remaining schedule for issuance of the SLR guidance documents and the receipt of two announced subsequent license renewal applications. As indicated, in about two -- three weeks we have a Commission meeting on subsequent license renewal. Following that meeting we expect in July that we will issue the final GALL-SLR report and the SRP-SLR. By the end of this year we should issue NUREGs that describe the technical bases and resolution of public comments. And as listed there, 2018, we expect an application from Peach Bottom. 2019 we expect to have an application from Surry. Those are two announced applications.

MEMBER SKILLMAN: Allen, let me ask you to take a deep breath right now.

DR. HISER: Sure.

MEMBER SKILLMAN. Stand by. And I want to communicate to my colleagues we're about to change channels. What Allen presented are the technical details regarding the documentation that will be used for subsequent license renewal, specifically three documents: the two volumes of GALL and the review plan.

What we're going to talk about next are program changes. And it's a somewhat different topic because it has to do with process for a license renewal for 60 years to 80 years.

So, colleagues, do you have any questions on the documentation or the technical details that Allen just presented, please?

MEMBER RICCARDELLA: Just out of curiosity, is Surry one of those two plants, Plant A or Plant B, that you presented?

DR. HISER: I don't know.

(Laughter.)

DR. HISER: A colleague put those two slides together, and I'm not sure which plants she selected for that.

MEMBER BALLINGER: Probably match the dates.

DR. HISER: I guess one could do that. We may have provided enough information there. Clearly what we wanted to convey was one program that had sufficient capsules and had withdrawals and tests. The other is one that we just don't want them to push that capsule out another 20 years.

So with that, I will turn it over to Billy Rogers.

MEMBER SKILLMAN: Thank you.

Bill, go ahead.

MR. ROGERS: Thank you. This is just on SLR optimization. My name is Bill Rogers. I'm a staff member in the Division of License Renewal.

Pardon me. Pardon me. So this is a presentation on SLR optimization. My name is Bill Rogers. I'm a staff member in the Division of License Renewal and today I will discuss the purpose of the Subsequent License Renewal Optimization Working Group and an overview of its activities, communications with utilities and stakeholders and several of the staff's recommendations.

Okay. Next slide, please. Thank you. The Division of License Renewal established the Subsequent License Renewal Optimization Working Group to evaluate the subsequent license renewal application

review process. The evaluation was performed in order to develop recommendations as to how the review process could be made more efficient and effective and to optimize the staff's performance relative to timeliness, application of staff resources and the quality of products.

The working group evaluation consisted of or considered both safety and environmental, project management tools, audits and inspections, safety evaluation reports and the subsequent license renewal application, the SLRA, review time line. The working group presented proposed staff position to industry and stakeholders during several public meetings and considered the comments received.

I'd like to discuss several of the proposed recommendations that impact the staff, utilities and would be of interest to stakeholders and the Committee.

Slide, please. Okay. So concerning the SLRA review time line, after completion of the working group evaluation for both the safety and environmental review the staff developed a subsequent license renewal review timeline of 18 months, which will begin at the completion of the staff's acceptance review of the subsequent renewal application. The

discontinuation of the routine use of a draft SER with open items, which I'll discuss that momentarily, was a primary contributor to the reduction of the staff review timeline from 22 to 18 months.

So the staff intends to present a draft final SER to the ACRS Subcommittee and a draft final SER to the ACRS Full Committee, revised as necessary.

The staff concluded that the draft final SER will provide a complete description of the resolution of all technical issues to support the staff's goal of increasing efficiency and effectiveness when considering the time and resources required to produce an interim SER with open items.

The staff is aware that the draft final SER presented to the ACRS Subcommittee may require subsequent revisions prior to presentation to the ACRS Full Committee to incorporate any comments received.

MEMBER SKILLMAN: Bill, how much time did you allow for that review and feedback by the Subcommittee to inform the SER?

MR. ROGERS: So between the two Committee meetings? Yes, we looked at that over a period of time when we were doing the evaluation. It has flexed a couple times and it's flexed between six weeks and four weeks. And I think that the concept would be

that depending on the nature of any comments we might receive during the Subcommittee meeting that that period could be adjusted to accommodate our response to the comments.

MEMBER SKILLMAN: Is that process acceptable under the current regulations? We speak -- the ACRS speaks as a Full Committee. We don't speak as individual members in the Full Committee. The flip side is when we're in the Subcommittee we're speaking as individual members. So if you come into the Subcommittee with a draft SER, call it final, we find a handful of comments, those comments are really comments by individuals, not from the Full Committee.

So my question is how has that important feature of the ACRS business process been taken into consideration by the staff? Remember, that we speak as a Full Committee. In the Subcommittees we speak only as individuals.

MR. ROGERS: Well, my impression is that we would address the individual comments from the Subcommittee to the extent necessary to prepare for the Full Committee. But I think from past experience, the amount of time to address those comments, it tends to be on the quicker side and that we try to address those immediately.

MEMBER SKILLMAN: Yes, I would like to --

DR. HISER: Yes, I think the expectation is that normally at the Subcommittee we have a list of open items, so think that technically we're not quite sure of the applicants -- that the applicant's proposed aging management is sufficient, if you will. And I think by coming to the Subcommittee with really a completed package we will have been satisfied that the applicant's proposals are acceptable and I think we will then be able to present a more complete message to the Subcommittee. Clearly any comments from the Subcommittee that we need to go back and reconsider, I mean, we will have to adjust our timeline appropriately. I don't think we would -- we would never try to rush the Full Committee meeting at that point.

MEMBER SKILLMAN: Thank you. That's what I was curious about. Thank you for answering that.

MR. ROGERS: So this relates to what you just said. Considering that the draft final SER will be presented at both the ACRS Subcommittee and Full Committee, the staff would propose that the ACRS Subcommittee and Full Committee be scheduled for subsequent months, because during the conversation that we just had I think we've addressed that there

may be opportunities or occasions where that might not occur.

MEMBER RICCARDELLA: I think the concern though is more this -- allows some time after the Full Committee meeting so that you can get our comments and consider them before you have to get it finally approved because the comments you get at Subcommittee won't be official, so to speak.

MEMBER SKILLMAN: That's what I was just trying to point to.

MEMBER RICCARDELLA: That's the point, I understand.

MEMBER SKILLMAN: That's the point I'm trying to make.

MEMBER RICCARDELLA: Which means you have to have some time after Full Committee to address comments.

MR. ROGERS: I don't think we've modified that period of time in the timeline.

MEMBER RICCARDELLA: Steve, do you want to weigh into this?

MR. BLOOM: Well, I just was going to repeat -- I was actually going to say the same thing Billy said, which is this was the time before the Subcommittee to the Full Committee, but we did not do

anything to the timeline of waiting for the letter from the Full Committee with or without any comments from you, if we have to address those comments. We did not touch that part of the schedule in any way.

So if there's a letter that's a very clean letter, then that makes -- we'll just go forward. If there are comments that come out of it, we'll have to address those. And again, as Billy and Allen said, that will adjust our schedule accordingly of how much work we have to do to address those comments.

MEMBER RICCARDELLA: Okay. Fair enough.

MEMBER SKILLMAN: But this is all within that 18-month window, though, right? So our meeting better be like 16 months.

MR. ROGERS: If comments are sufficient enough that we have to go back and do a lot more work, then we will have to of course tell the applicant that you are not -- we didn't have enough information based on ACRS, and that will therefore make the schedule go out longer than 18 months.

MEMBER SKILLMAN: Okay. Thank you.

DR. HISER: And I think one thing to remember as well, the 18-month schedule assumes a very high-quality application, a very responsive applicant, a request for additional information, hopefully

minimal comments from ACRS on things that we need to go back and reconsider or reevaluate. And so that 18 months is really best case scenario. Any other elements that are not sufficient, the schedule will have to move.

MEMBER SKILLMAN: Thank you. Let's proceed.

MR. ROGERS: Okay. We'll move onto a slide --

(Simultaneous speaking.)

CHAIRMAN BLEY: Billy, can I interrupt you before you even get into this slide?

MR. ROGERS: Yes.

CHAIRMAN BLEY: I just want to raise a couple points that maybe you can address as you go forward. You don't need to answer them as I raise them.

MR. ROGERS: Okay.

CHAIRMAN BLEY: At the Subcommittee meeting we talked about some of the inspection areas and a few of us got -- were a little surprised and said we really counted on the results of the inspection as we were doing the original license renewal. You folks discussed some of the things that might not make that the same, which is they have just

done inspection not long ago and then they're coming with subsequent license renewal. There are lots of other things.

But I went back and read those inspection procedures a little bit and -- a couple points and then I'll come up with a question for you to think about later. If we go back to 71002, it has two areas that were important in our thinking back then, and for me may still be important. One is 71002 has a section on material condition that must be consistent with the claims of the application. Kind of makes sense to me. And then it has a fairly extensive section on operating experience and relating that to potential extension.

71003 has no material condition requirement for the inspections and it has -- the only thing on operating experience is whether the licensee updated the AMPs as a result of recent operating experience.

Now at least to me it feels like when we get out to the short period before -- and I guess that's your Phase 1. Before we go into the subsequent license renewal period of extended operation something in 71003 ought to address the material condition being consistent with the claims and the operating history

from the last time that was looked at up until that point being an important part of that inspection. It doesn't seem to me that those are. And from the way you talked, I don't think it was intended to be there. But it seems an important issue.

And when you -- if you've got a couple of slides talking about these, you can wait until then to talk about that, but right now I'm thinking I would want to say something about those two areas: material condition and operating experience.

MR. WILSON: No, and actually; this is George Wilson, I'd like to address those. I used to be a resident and a senior resident. So first let's talk about the material condition.

The material condition of the plant is evaluated every day that there's an NRC inspector on the site. When I walk out into the plant, you're looking at what is the material condition of the plant? You're also -- that's part of the resident's routine inspections, and when another inspector goes out there.

Secondly, the resident inspectors read every Corrective Action Program or document that goes into the CAP program at a site and they evaluate that and they bin it. So you get aging management insights

based on what's in those corrective action documents.

So the material condition, I want to highlight, is looked at constantly. And I'm going to --

CHAIRMAN BLEY: Before you pass that one --

MR. WILSON: Go ahead. Sure.

CHAIRMAN BLEY: -- the requirement in 71002 -- and the same thing's true for operating plants today, but before they came to 71002, it asked that the material condition must be consistent with the claims in the application. And that's where I was coming from, that we ought to look -- it seems to me that somewhere before you hit that second extended period of operation, we ought to look back at what those claims are. And from that point of view, you've been looking at the material condition, but does it really justify moving forward. And I'm not sure how you pick that up --

MR. WILSON: Okay.

CHAIRMAN BLEY: -- if it's not included as it was in 71002.

MR. WILSON: Right. So the second aspect that I wanted to -- and I'm jumping a little bit ahead on Billy, but to try to address your comments now, the

71003 inspections are broken down into four phases. Something that's a little bit different in them than just the 02 inspection also, as you read through them, you would notice that there's actually a performance portion of it, which actually is beneficial for us because the NRC does a licensee's performance and then based on the performance of the licensee we take oversight actions or corrective actions. We can add inspections or do more focused inspections in areas.

So let's run through the 71003 phases real quick. Phase 1, which is done before the PEO period, it's opportunistic, but it's always done. You actually go look -- the refueling outage or two refueling outages before a licensee goes in PEO -- and I go into the inaccessible areas, the normally inaccessible areas of the plant. You get a great indication of the housekeeping of the material condition that a licensee maintains when you go into those normally inaccessible areas.

So the outcome of the Phase 1 inspection done a refueling outage or two refueling outages, along with the operating experience; and Billy will get in here, and the aging management insights that we actually garner from the different baseline inspection procedures: equipment alignment, flood protection,

heat sync; and Billy will go on them, we actually get aging management insights through those that we take that information along with the performance with the licensee and the Phase 1, and there's a large, large team inspection. The 02 -- the Phase 2 inspection 71003 is a very large team inspection.

Based on the overall performance of the licensee in that inspection -- so let's say there was a dual-unit site and the NRC was not satisfied with Unit 1's overall evaluation of their aging management programs. We would then talk with headquarters and the regions would talk. And the Unit 2 would be another very large team inspection to verify that they've put corrective actions in place and corrected and evaluated the concerns that we had brought up.

If we went to the first unit and we didn't find anything, only maybe one little area, it only might be one person instead of a team that would go out on Unit 2 and focus that. The outcome also of the Phase 2 inspection would lead into the Phase 3 inspection, which then if the licensee's performance -- and these are actually programmatic reviews, so they're actually looking at the AMPs and the program as a whole -- we would then talk and potentially pull that inspection up and do it earlier just to make sure

that the licensee was looking at that.

When those inspectors are going out and doing those inspections, they're not only just looking at the aging management programs. They're actually looking at the material condition. The aging management insights that we get -- and we've got some examples, like containment liner degradation where the concrete and the -- we picked up in some ISI inspections. That's fed into that evaluation. Do we need to go out and do that inspection early? Is the material condition there? Let's -- and we've got some examples at another site where the fire header just zippered open. All right? So then we take that and we feed that in the overall licensee's performance. Then we take that action and tailor the programs for that licensee.

One of the things Billy's also going to be discussing is we're going to tailor the audits that we're going to do that's going to address one of your concerns based on when the plant got their original license. Were they GALL, before GALL, GALL 1, GALL 2? And also include the inspectors from the region and the residents on those inspectors, use the insights. There's always open constant communication between headquarters and the residents and the inspectors that

do those sites. And during the yearly and semi-annual evaluations with -- that the region has on the licensee's performance that's evaluated.

So when you take the material condition and you're looking at -- and I do understand your point. I just wanted to show this is a lot more robust. When it would come for like an SLR -- so like for a license renewal, we would have looked at -- we'd have did an AMP audit and the 02 inspection. By the time we get an SLR submittal in from a licensee, I would have did the 02 inspection, I would have did the AMP audit for the license renewal, I would have did the Phase 1 inspection of 03, I would have did the Phase 2 inspection of 03. And then I would have -- that's before we'd get an SLR. Then I would be doing a very robust audit including the inspectors. So five looks would be done on the aging management programs as a whole and specific AMPs for SLR.

So that is -- I'm just showing that the robustness -- and they're looking at the material condition, what it was supposed to be. How's it degrading? Is it -- where it was. So that is actually being addressed in the overall process and how we're doing it. And we focus -- the performance is the key in the 03 inspections because I'm focusing

it based on a licensee's performance. And you can -- and through those insights that I described you tailor that.

So I understand your comment, but I think it's being addressed more robustly over -- because we're getting more run time on the overall look at those programs and for the licensee.

CHAIRMAN BLEY: George, thanks.

MR. WILSON: I'm sorry to interrupt.

CHAIRMAN BLEY: That was a pretty thorough explanation. I appreciate it. Thank you.

Billy?

MR. ROGERS: I'd like to just rephrase that a little bit. In the Subcommittee meeting a number of us were concerned that the inspection, the final inspection, if you will, prior to subsequent license renewal would take place during the license renewal period quite a bit before the entrance to PEO, say five years. Pick a number. And it looks like slide 23 sort of addresses that.

So our concern was that the last serious inspection might take place five years before the period of extended operation, and a lot can happen in five years. And so we made that comment during the Subcommittee meeting.

MR. WILSON: Yes, George Wilson. The key is actually; this is performance based, we'll move or slide inspections back based on a licensee's performance. Even the Phase 4 could get slid back if we were very comfortable to do it closer to the SLR.

MEMBER SKILLMAN: I want to make the comment that the inspection manual chapter you're looking at and that I'm looking at are the same ones. And you're accurate. There is a team inspection. It's at Phase 2 and it is as you described. The text is that Phase 2 of the inspection is intended to be a one-time major team inspection per site. I've got that. Three and four actually become optional in the current procedure.

MR. WILSON: Well, right. And the reason about that, that is based on the overall outcome of the Phase 2, but --

MEMBER SKILLMAN: Okay. But that -- George --

MR. ROGERS: -- we have not --

MEMBER SKILLMAN: -- just a minute.

MR. WILSON: Okay. Go ahead.

MEMBER SKILLMAN: That's the information we have.

MR. WILSON: Right, and --

(Simultaneous speaking.)

MEMBER SKILLMAN: -- Dennis' question, my question, Ron's question.

MR. WILSON: So right now to -- and you're exactly right, they're -- and they say they're optional because it's based on performance, but right now everyone will be getting that -- that we've had, they've gotten to Phase 3 and we did that look. It's also based on how comfortable we are in the overall performance. That's why I was saying you pull -- you take the insights from the individual licensee and decide if you wanted to move that up.

So if the regional inspectors and the headquarters staff was not comfortable with a plant that was coming in for SLR and we would say, hey, look, we want to pull that Phase 3 inspection up and look at the overall outcome -- but like the plants coming in for an SLR, they -- the first one actually has already had the Phase 3 inspection; the other will get it. But -- and me -- my discussions with the regions, we do plan on doing -- even though they are optional, right now we do plan on doing the Phase 3 and Phase 4 inspections at the facilities.

MEMBER SKILLMAN: Let me just add one more comment that reinforces what both Ron and Dennis said.

If there is an 18-month or 24-month time period between the actual walkdown team inspection and the entrance into the PEO, that's a long time. And if you had a plant that has a complacent staff, the plant then enters the PEO for the first day of the 61st year might not be the same plant that was on day one of the 58th year.

And so what you're experiencing here is some caution by this Committee relative to knowing that when that plant actually tumbles into day one or the first day of the 60th year it really is ready to run for 20 more in accordance with its design-basis, and it's material condition reflects that.

MR. WILSON: Right, and I do -- this is George Wilson. I do understand the point. I think that I was -- that was the reason that I was highlighting that these are performance-based inspections.

MEMBER SKILLMAN: Yes, I got that.

MR. WILSON: It's not just that I'm taking just the Phase 2 inspection of 03. I'm taking the overall operating plant condition and monitoring that we're doing in the ROP where I get additional insights from the normal ROP baseline inspections. With those insights and the material condition that the residents

are walking around, the NRC then makes decisions.

So I'm not going to list the plant, but there's a plant that's going to get a Phase 3 inspection -- actually going to get a robust -- it's not a Phase 3 -- going to get another robust Phase 2 inspection because of that performance. We're seeing some other things; and I'm not going to say what the plant is, but one of the regions have already called and they're actually going to go do another full-blown team inspection on the opposite unit for Phase 2 because of some insights they've gotten from the ROP and the plant's performance.

So I'm very comfortable of taking and looking at the overall assessment we do for a reactor during the ROP, taking those insights and then the insights we're getting where we can go out and look at the aging management program and the processes themselves, and looking at that and deciding whether or not we're going to pull up the inspections to verify everything it has they told us.

MEMBER SKILLMAN: Well, I appreciate your very strong commentary here because it's consistent with what I would like to see in the letter that communicates the importance of those physical inspections. And whether they're conducted as a late-

breaking 71002 or they're done in Phase 2 as a team inspection to confirm that the facility is good to go, it's up to you. The real issue for us is making sure that the plant has a material condition that it's what it needs to be. So as long as you're comfortable with that, that's certainly where we are.

MR. WILSON: Right, I mean, right, I'm the director and the license renewal, the SLR would not go through me until I was comfortable with that.

MEMBER SKILLMAN: Good. Very good.

MR. WILSON: We would make sure we did that inspection.

MEMBER SKILLMAN: Okay. Thank you.

MR. WILSON: All right. Thank you.

MEMBER SKILLMAN: Billy, go ahead.

CHAIRMAN BLEY: Sorry.

(Laughter.)

MEMBER SKILLMAN: I'm sorry, Dennis. I might have terminated the conversation you wanted to --

CHAIRMAN BLEY: Oh, no, I was just saying sorry to Billy --

(Laughter.)

MEMBER SKILLMAN: Okay. Thank you, Bill.

CHAIRMAN BLEY: -- for diverting his --

MEMBER SKILLMAN: Please go ahead, Bill.

CHAIRMAN BLEY: -- show here.

MR. ROGERS: This first slide is just the agenda of the things that I'm going to speak about over the next few slides. Okay?

Slide, please, Don. Okay. This slide provides a generic timeline for the license renewal activities and audits. You can see there that the IP71002, which is a pre-implementation activity that occurs prior to the issuance of the renewed operating license. And following the issuance of the renewed license the AMPs are implemented and subject to verification in Phase 1 and Phase 2 of IP71003 just prior to entering PEO. And Phases 3 and 4 of IP71003 occurred during the period of extended operation.

Next slide, Don. So this slide adds a generic timeline for the subsequent renewal activities, to illustrate when the activities will occur following receipt of the SLR application. And here we've highlighted where the additional PEO is on the left and then in the subsequent PEO on the right in red. Shows there's somewhat of an overlap of certain activities.

CHAIRMAN BLEY: Let me try one other question on you folks. Many of the arguments that we

just heard make a lot of sense, but also seem they would fit the first license renewal. But at the first license renewal, for some reason, you wanted an 02 inspection as well. Now, I can invent some reasons for that, but tell me why you wanted an 02 inspection for the first one and you don't think you need it for the second one?

MR. ROGERS: Okay. So I'm going to address that --

CHAIRMAN BLEY: Okay.

MR. ROGERS: -- specifically.

CHAIRMAN BLEY: That's good. I'll wait.

MR. ROGERS: Okay. So, let's see, slide, Don, please. So this describes the IP71002, the license renewal inspection, which is a pre-implementation inspection performed during the license renewal application review. And this is performed approximately 11 months after receipt of the application. And that has moved around a bit in time over the review periods. And again, it's prior to issuance of the renewed license.

The regional inspector review includes verification of the scoping and screening process, assessments of the applicant's plans to implement, aging management programs to review the documentation,

past test analyses and plant walkdowns, and then verification of the applicant's operating experience review.

Okay. Slide, Don. So IP71003, the post-approval --

MEMBER SKILLMAN: Bill, let's back up. So just for timeline, 71002 on a plant that was licensed in say 1980, the 71002 would probably have been conducted around 2000 or 2005, 20-25 years later.

DR. HISER: It would depend on when the application's --

MEMBER SKILLMAN: Bingo.

DR. HISER: Yes, it could be -- it could have been year 2000, which would be about year 20.

MEMBER SKILLMAN: Yes.

DR. HISER: It could be as late as 2018 when the plant's 38 years old.

MEMBER SKILLMAN: Right. Okay. Fair enough. So this is in the first -- within the first 40 years after the operating license was issued.

MR. ROGERS: So the 71002 would -- it occurs within the 11 months of receipt of the application.

MEMBER SKILLMAN: Yes. So if the application came in after the plant was out say for 20

or 25 or 30 years, it would have been 6 or 8 or 10 years prior to the 40-year clock?

MR. ROGERS: Yes.

MEMBER SKILLMAN: Good. Okay. So we're talking about the first 40 years, and the 71003 is the follow up to that inspection that was conducted --

MR. ROGERS: Yes.

MEMBER SKILLMAN: -- before the first 40 years timed out?

MR. ROGERS: For the PEO, yes.

MEMBER SKILLMAN: Good. That's the only point I'm trying to make.

MR. ROGERS: Okay. So let's see.

DR. HISER: And actually I did misspeak. For a plant that received their operating license in 1980, for timely renewal they would need to come in before 2015 --

MEMBER SKILLMAN: Yes.

DR. HISER: -- five years ahead of the end of the license.

MEMBER SKILLMAN: Yes.

DR. HISER: Sorry about that.

MEMBER SKILLMAN: Okay.

MR. ROGERS: So this discusses IP71003, the --

MEMBER SKILLMAN: We don't let it go that -- we don't want to let go of that timely removal -- or timely renewal topic here. We want to touch on that before this meeting ends.

MR. ROGERS: Okay. All right. So the IP71003 is a post-approval site inspection for license renewal. And George discussed, it's performed using a four-phase approach following the issuance of the renewed license. IP71003 Phases 1 and 2 are large multi-team inspections performed to assess a licensee's readiness to enter the PEO by verifying AMP implementation and completion of inspections, tests and analyses. And you'll note that if you've reviewed the inspection procedure, large is roughly 11 to 2,000 person hours, depending on the site.

In addition, the team verifies that license conditions have been met and changes to commitments -- conditions in the UFSAR that have been in accordance with the regulations.

Then the distinction between Phase 1 and Phase 2 is that while the Phase 1 and Phase 2 activities are the same, that the Phase 1 is performed during the second to last or the last refueling outage prior to PEO to gain access to areas that wouldn't be accessible during operations. So that's why they're

split into two pieces, Phase 1 and Phase 2. And the remaining, anything that's not inspected in Phase 1 is in the larger inspection in the Phase 2.

Phase 3, which is likely to occur one to two years after the licensee enters PEO reviews the implementation of license conditions, regulatory commitments and AMPs and TLAAs with implementation schedules that occur during the PEO. So some items might not actually be implemented until they're actually in the period of extended operation, and Phase 3 would pick those up. And also a large component of Phase 3 is to review corrective actions for any issues identified during the earlier Phase 2 or Phase 1 inspections.

CHAIRMAN BLEY: Billy, I'm going to interrupt you, and I'm either going to help you or display my ignorance, or both.

What I thought you were going to tell us is that the 02 inspection you need for the first one because we'd have a plant operating for toward 40 years and they haven't had any aging management programs or TLAAs, and that gets you ready to go into this. Where when we come to the second period of extended operation, they will have been implementing these AMPs -- not all of the ones they'll need, but

many of them for 20 years, or on that order. And therefore, you don't need to see that they're kind of set up to be able to do them.

MR. ROGERS: Well, I'll jump ahead of myself a little bit. We have a crosswalk slide which you might have seen, but it goes through and compares what we do in the different inspections. But I think that the -- what you said is well worth considering is 71002, it's inspections, it's a pre-implementation inspection. And when the inspectors go to the site, in the same way that the auditors go to the site; and I do an audit at the site, there are books, there are documents to read, there's a lot of things to look at. But what is not in place necessarily is an implemented AMP.

And when AMPs are implemented, what that means in practice is that they will have taken the concepts that are in the AMP; and they're big basis binders for the AMPs, and the utilities have to take those concepts and roll them through their implementing procedures. So there's inspecting procedures in the plant, operational procedures. And the AMPs get broken into procedures and put into these procedures. And there's preparation of staff, there's assignment of program managers, there's a whole lot of

different activities that go into the actual implementation of the AMP.

So when we're in 71002 space, that has not yet occurred. When we're in 71003 space, that has occurred. So relative to what you said earlier, for initial license renewal when we do the 71002, that has not yet occurred, or not to any great extent. And we look at that.

So when we're in subsequent license renewal, all of that will have happened. All of that will be implemented, with a few exceptions, and generally operational. And that is the significant difference between why you would do an 002 for license renewal but you would not repeat that necessarily for subsequent license renewal, because the subject of the task is not in the same configuration.

CHAIRMAN BLEY: Sounds like a yes to what I asked you.

MR. ROGERS: Okay. Well, I'll stop then.

(Laughter.)

MR. ROGERS: I'll take a yes.

MEMBER RICCARDELLA: As I read it, part of the 002 inspection was verifying the scoping and that aspect of it and selection of the components. And in the 003 -- when you go in for subsequent license

renewal, I mean, there's no new components. The scoping is pretty much done. I don't see that that needs to be redone.

CHAIRMAN BLEY: Yes, absolutely.

MR. ROGERS: So I'll address the new phase of IP71003, which is this Phase 4. That was added by revision in 2016, just last year, and it's intended to be performed 5 to 10 years in the period of extended operation. The purpose of Phase 4 is to verify that the licensee is managing the effects of aging in accordance with the AMPs as described in the UFSAR and also to review implementation of the AMP's elements during PEO to ensure that the SSEs have maintained their ability to perform their intended functions. The NRC has not performed that inspection as of yet.

Next slide, Don, please. Okay. This slide just addresses the timing of the phase. We discussed this already. It just lays them out and talks about them so you can compare those. But you see it's -- I think we discussed that.

All right. Okay. Allen?

DR. HISER: Yes, I guess the other thing just to reinforce, 71002 looks at plans for AMPs, 71003 looks at implementation of AMPs. So it's no longer a notebook as Billy mentioned, but it's

actually things that the plant has done. Generally there are inspection results that are available so you can assess whether the plant -- the AMP is finding things. That is I think fundamentally the difference.

With the -- you saw from the list of AMPs at least compared to Rev. 2 there are not very many new AMPs. Now some of the early plants are going to be pre-GALL, so there may be more AMPs that are new for the SLR application, but plants have been doing aging management from actually before they constructed the plant. So the -- it may be that for -- with license renewal these are new AMPs from the way it's -- they're laid out in 10 elements, but they've been doing the procedures and many things since the plant first opened. So there's nothing really unique.

I mean, now there's more emphasis. There's maybe a definition of the AMPs within 10 elements, but they've been doing many of these things. They're existing programs in most cases.

MR. ROGERS: Yes, I would add to that. I think what the AMPs do and what occurs during the development of the application, the performance of the 71002 inspection, the AMP audits and the technical review is the utilities go through a thought process which takes often existing programs and focuses them

on the effects of aging. It already existed, but it's more of a mindset as they go into the period of extended operation.

MEMBER STETKAR: Billy, and what you just said resonates with me, okay, because everybody says, well, everybody has been paying attention to all of this throughout the life of the plant and the inspectors have been doing all of the reactor oversight process and everybody is in lockstep, but when we've seen specific examples of plants that have come in for their first license renewal, somebody said, well, look at all of this experience in the context of aging. And we've discovered stuff by looking at it in that context. Because for some reason people over the 20-25 years or so didn't think of it that way.

It's not clear to me because these are AMPs. They're not procedures. They're AMPs. I have an aging management program and I say this aspect of the aging management program for this system is in this part of my normal maintenance or surveillance program that I've implemented for the last 25 years. Maybe I've had to tweak something a little bit. So there's a danger that it gets redistributed, if you will.

And where does it come back together again? Where does that kind of focus of what have we learned over; and I don't care what the period is for right now, X period of time trigger that notion of, hey, let's look at that again in the context of aging, not in the context of have we been following all of these distributed procedures and inspecting against all of those distributed procedures?

MR. ROGERS: Yes, well, that's a good question.

MEMBER STETKAR: That's kind of what I'm looking for.

MR. ROGERS: So the way that that typically occurs is the -- then there's a couple parts of this, but the first way is that utilities have program managers for aging management programs, so there is typically a point of focus to keep considering that as time goes on. And the second piece to that is the utilities have a commitment to consider the operating experience, which we issued an ISG on that effect. It's part of the aging management programs and it is -- in addition to the application and the AMP documentation our review of operating experience is the single most rich source of information supporting our review of the aging

management programs.

MEMBER SKILLMAN: Bill, I would just join John in raising that flag. It is a mindset, like you said, but I've been involved in plants that had a mindset to let the plant fall apart. And they did have system engineers and they did have component engineers, they did have maintenance rule, they did have system health reports. And in spite of that the plant literally dissolved around them, and it turned out to be a money issue. How much money was management going to put into maintaining the plant?

So these words are all well and good as long as there is a discipline within that facility to maintain the material condition of the plant.

To give a couple of examples, we've had applicants come in here for license renewal, and I think unless we pushed them they would have been happy to start it up with two studs missing from the reactor vessel head. We found applicants that literally turned off their cathodic protection system 15 years ago and let it languish.

So like John says, we've listened to an awful lot of interesting things that would cause at least this experienced engineer to say I'm not sure someone's on watch and I'm not sure someone is really

anticipating wanting to take this plant from 60 to 80, because if you're going to take it from 60 to 80, you've got to protect it to 60. And hence, the pushback you're getting here.

I understand your use of IP71003. 71002 gave us the thick magnifying glass inspection. I think what we're searching for is assurance that before we get into the PEO there has been another really thick magnifying glass inspection with formerly documented results that give us assurance that the material condition is what it needs to be in spite of all this.

DR. HISER: Yes, well, I think in part that's what Phase 4 is intended to do. I mean, the plant says they have AMPs. As George has described, there are many elements of the ROP that try to verify that the plant is doing the things that it needs to maintain the plant safely.

MEMBER SKILLMAN: Okay. So the Phase 4 can be at plant age approximately 50, is that correct?

DR. HISER: Forty-five to fifty, that's correct.

MEMBER SKILLMAN: Forty-five to fifty? And if the physical inspection that comes out Phase 4 gives the same kind of inspector insights and material

condition results that we saw in IP002, I think we're going to be good to go. But that's what's got to come out of Phase 4.

MR. ROGERS: Well, I would add that the Phase 2 inspection that occurs within the year of PEO, that is a very deep scrub.

MEMBER SKILLMAN: But that could be 17 years ago, if I'm right on the cusp of 60.

MR. ROGERS: No. No, it's just prior to PEO. It's 3 to 12 -- it's within 3 to 12 months. It's just prior to PEO.

MEMBER SKILLMAN: So you're saying that is at age 56 or 57?

MR. ROGERS: Yes. Yes, sir.

MR. WILSON: This is George Wilson again. I'm going to -- I might have missed a point that I said and I might not have said it clearly. So to try to get at I think a point that you're making, one of the things that we're going to do; and the regions have already stated that they wanted to participate, we're going to put the resident or one of the regional inspectors that actually are aging management program specialists that the region has -- they will actually participate in the audit for SLR.

We also plan on making them available for

you to ask questions during the review on the material conditions of the plants working with the regions. So I think that will help address some of the material conditions questions you have. So we do -- like I said, we -- they -- in fact they -- the regions have asked can they put more than one person on the audit? And if we have to we will. But that question will be thoroughly addressed before we would give the SLR on material condition. And we will do what we -- we'll make sure that we have an inspector available during the review of the SLR for you guys to ask questions and address some of your concerns.

MEMBER SKILLMAN: Okay. Thank you.

DR. HISER: Yes, and I think if we go back to the 18-month schedule, we said high-level complete application, very responsive to RAIs. And I think in addition that schedule can adjust based on what we find in the inspections, based on what we find in the audit. If we find issues, then that clearly will impact the schedule and our ability to complete our review to find reasonable assurance.

MR. ROGERS: Yes, and I would add one more thing to the list of the quality application would be adequate resolution of all previously known technical issues, because there's a lot in the SERs that

demonstrate what an acceptable resolution of common technical issues might be.

MEMBER SKILLMAN: Okay. Let's proceed.

MR. ROGERS: Okay. Slide, Don? So this is the crosswalk. It provides a list of activities that occur during the license renewal application review process. And that's in the first column. The second column is what occurred during the initial license renewal. And the third column is what we intend to accomplish during the subsequent license renewal process.

So the first two rows there: walkdowns of the plant, review of plant's material condition, interviews of plant personnel. These were accomplished during the IP71002 inspections. And also the headquarter audits and the IP71003 inspections during the first renewal.

Additionally walkdowns and interviews to assess age-related degradation activities occurs regularly by the resident and regional inspectors in accordance with the baseline inspections performed under the ROP. Many baseline inspection procedures have been updated to incorporate aging management inspection guidance. And I'll discuss those in a moment.

For SLR headquarters staff will continue to conduct interviews with plant personnel as to walkdown of relevant structures and components during AMP audits. The IP71003 inspections for SLR and baseline inspections under the ROP can also be credited for the performance of walkdowns in interviews. And again, I'm getting a little ahead of myself, but the intent is, as George mentioned, to have inspectors participate in the audit, onsite audit process in lieu of the 71002 activities. And I have some further -- I think some further basis for that.

The third row AMP evaluation. So during the IP71002 inspection audits for the first renewals, the inspectors and auditors reviewed the applicants' plans to implement AMPs. During the IP71003 inspections for license renewal the inspectors verified implementation of the AMPs and completion of inspection tests and analyses. So for subsequent license renewal there is a small subset of AMPs that are new, the ones that Allen discussed, while the other AMPs are existing AMPs that have implemented by the applicants.

So the staff will continue to review the pre-implementation information for the small subset of new AMPs and the information related to the majority

of AMPs which have been previously implemented during AMP audits and the IP71003 inspections. So we do intend to look at the pre-implementation information for the -- I think the two AMPs that you listed, the one that's broken into three and any plant-specific AMPs that exist for an application.

The headquarters staff will work with the regions to implement the tailored approach to the AMP audits for SLR. The scope of the AMP audit will depend on when the plant was originally licensed against the pre-GALL report or GALL Rev. 0, 1 or 2, accordingly.

The scoping and screening review, as was alluded to earlier, during the IP71002 inspection audits for the first renewal, the inspectors and auditors reviewed the applicants' scoping and screening methodology. The inspectors place a focus on non-safety affecting safety. And the headquarter auditors, which is myself and team, we do a complete scrub on site of their methodology, identify the SSEs and the scope. For SLR this activity will be performed again during the AMP onsite audit.

I said add also that for that particular subject, scoping and screening, the headquarters staff and the region were -- during the review, following

the review, that's a common -- we have common communications on that, or often we have communications on that subject. So there's a lot of interaction. Probably in the first 40-50 percent of the reviews there would often be a regional inspector going on the scoping audit. In addition to doing the inspection, they would go on the audit that I would lead just to gain more information. And different divisions in the agency also participate.

The operating experience review, which you mentioned, Mr. Bley. During IP71002 inspection and audits for first renewals the inspectors/auditors assess the applicant's operating experience review. For SLR this activity will be performed during the aging management program audit.

Now, I just want to emphasize that this operating experience review is really an extensive activity for us. We have a set of practices we have in place. We directly access their CAP program when on site and do independent evaluations of corrective action reports. So this is a big part of the review. It routinely affects our evaluations and conclusions in the SER. This will receive the same amount of focus during the subsequent license renewal with an additional component of how the AMP has dealt with

age-related degradation. So it is actually more complex for operating experience in the subsequent renewal period.

So again, during the onsite AMP audit when we look at operating experience or if we happen to do that during another activity on site, the inspectors would be -- hopefully be involved with that process.

MR. WILSON: And this is George Wilson again. Actually one of the comments that you stated, we'll make sure the AMP audit will be available to you and we'll actually address the material condition of the plant compared to what they AMP is and the effectiveness of it. So that should address one of the statements that you made. We'll make sure that we add that and the AMP audit that we do is more robust and actually addresses some of that concerns with the inspectors.

MR. ROGERS: Okay. So the observations identified documented reports. That's during the initial license renewal review both the IP71002 inspection and headquarter audits resulted in similar observations with similar documentation of the outcomes. Since the IP71002 inspection is a pre-implementation inspection, the items did not rise to the level of findings or violations, but were instead

treated as observations and documented in the inspection report and resulted ultimately in updates to the license renewal application.

Similarly, issues and questions identified during the headquarters onsite audit were documented in audit reports and the safety evaluation report promulgated through RAIs and also resulted in updates to the license renewal application.

The IP71003 and the ROP baseline inspections; the observations/findings can also become violations, are identified and documented in the inspection reports as appropriate. So for SLR the headquarter auditors will continue to document the AMP audit observations in the audit report, the safety evaluation report and process the observations to request for additional information and result -- have the results -- have it result in updated SLR applications.

In addition, similar to first renewals, for IP71003 and ROP baseline inspections the observations were made findings and violations if appropriate and documented in the inspection reports. The point that I am making there is that in the IP71002 pre-implementation inspection it moved toward documentation in the report and changes to the

application for both the audit and the inspection.

So there's two other areas I'd like to address which actually are not on that slide, but I think are relevant and some of which we've already discussed. But I'd like us to go through these again.

During the initial license renewal process inspectors performed the IP71002 inspection. The 71003 inspection would on occasion participate in headquarters audits. Additionally, inspectors routinely assess how the licensee addressed age-related degradation during baseline inspections under the ROP.

For subsequent license renewal inspectors will continue to perform inspections of licensee's performance in addressing age-related degradation as part of the baseline inspection activities under the ROP. It's also important to note that headquarters and regional staff continually communicate during the license renewal process and will continue to do so during the subsequent license renewal process. Both parties share information to -- on operating experience, AMP evaluation and technical issues as required to complete that review. And again, this is an ongoing conversation. It's routine conversation.

As far as the ACRS meeting presentation we

consider the comments in the Subcommittee meeting on the subject and we know that the first license renewal inspectors presented on inspection observations and the plant's material condition during the ACRS meetings. So for subsequent renewal a regional or resident inspector will be requested to present to the ACRS on the material condition of the plant and observations made during the first renewal's IP71003 inspections and any other observations that might have been made -- that can be made based on participation in the aging management program audits or other onsite activities, including ROP baseline inspections. So our intent is to have an inspector present at both Committee meetings to address those concerns.

MEMBER STETKAR: Billy, can you help me? I was trying to read and listen and think at the same time. I was being ineffective at doing any of those things. I hear you saying that your intention is to have regional inspectors participate in the AMP audit for subsequent license renewal. Is that an intention or do you actually have some sort of written firm commitment that that shall be?

MR. ROGERS: Well, I'll address that and then there may be another comment in the room.

MEMBER STETKAR: Okay.

MR. ROGERS: But, so the concept of the inspections in SLR, we have been discussing this with the region for at least a year. We have routine phone calls and we went through the process and discussed how they fit into the SLR process. When it became apparent that we were heading in the direction of not having the IP71002 repeated for the reasons that we've already discussed, then the concept of having the inspectors' perspective and knowledge of the plant -- how does that get fused back in to our process?

Well, we're going to do an onsite audit. And so we floated that idea to the inspectors. And this is staff and management-level branch chiefs. And we asked would you be supportive of participating in the onsite audit? And they said yes, and may we send multiple inspectors to support? And that's an informal request.

MEMBER STETKAR: Okay. So far that's informal, but --

MR. ROGERS: Okay.

MEMBER STETKAR: -- if I'm an inspector, I'm --

(Simultaneous speaking.)

MR. ROGERS: However, recently there's been additional conversations at the management level

between DLR and the regions.

And maybe, George, would you like to address that?

MR. WILSON: Yes, this is George Wilson. I just had conversations. There is an intention that each one of the regions will participate in the audits for the SLR. In fact, I mean, I just had that with the division-level management and that is the intention. And I will make sure that through my conversations they do participate.

MEMBER STETKAR: The intention and oral things are -- sound good in meetings like this. What I'm looking for is is there a commitment that when I constitute an AMP audit team in headquarters, there shall be -- in writing there shall be participation by at least one regional inspector, or one of the resident inspectors from that plant --

MR. WILSON: No, but --

MEMBER STETKAR: -- in terms of an office instruction or something like that, however this is implemented?

MR. WILSON: Well, there is no office instruction that does that.

MEMBER STETKAR: Okay.

MR. WILSON: That conversation will be

held between me and the other director in the region associated with the aging management, which in each one of the regions is a DRS director.

MEMBER STETKAR: Okay.

MR. WILSON: So I also -- I mean, I understand what you're saying, but we also give them FTE for the inspectors to go out and do that. And that will be provided, so they will provide support back to cover the FTE that we're giving to them.

MEMBER BALLINGER: But with all due respect, you probably will be here forever, but maybe not. And so the person who replaces you might not have the same intention or might not have the same idea.

MEMBER STETKAR: Or budget.

MEMBER BALLINGER: Or budget.

MR. WILSON: I understand the comment. So right now there is no formal agreement. I'll have to work in the DRS meeting that we have biweekly and see if I can get a -- I don't know if I'm going to get a formal agreement, but I understand what you want. But right now that is the intention and that's what I was told they would. So, but there is no formal agreement. I'll see what we can do to go about do that.

MEMBER SKILLMAN: Thank you, George. Yes, let's proceed.

MR. ROGERS: Next slide, please? Okay. This is a list of the ROP procedures that have been updated to incorporate Aging Management Inspection Guidance. And you can see it's a -- there is some equipment alignment, flood protection measures, heat sync, in-service inspections, maintenance effectiveness, component design-basis inspection and PI&R inspections.

The inspection procedures that are listed, they can provide useful information during the review of the SLR application and insights on aging management to be utilized during the IP71003 inspection and also the SLR aging management program audits.

Okay. Slide, Don? Okay. In closing we'd like to reiterate that the license renewal functions will continue to be performed for subsequent license renewal. The activities that support the review of the SLR applications such as the AMP audit for SLR in the first renewal IP71003 inspections may need to be tailored on a plant-specific basis to ensure the review is adequate and timely. The staff has confidence that reasonable assurance of the adequacy

of the applicant's implementation of AMPs and aging management activities for subsequent license renewal will be obtained based on the staff reviews and inspection activities.

We appreciate the present on the SLR staff guidance documents and the SLR Optimization Working Group results. Thank you.

MEMBER SKILLMAN: Okay. Question: Before we lose momentum here, or interest, I would like to talk for a few minutes about timely renewal. So I'm a plant manager and I'm an executive of a plant out in the middle of *Dances With Wolves* and I haven't done squat for my plant. My plant is just -- I'm hanging on. I listen to what George says. George says I've got the ROP. All I'm interested in is performance indicators and I've got half a dozen systems that are in system health red. I'm hanging on by a thread with the maintenance rule and I'm at 54 years, 11 months and 28 days. And I just tell my administrative people put in the application because I'm going to be timely renewal for life beyond 60, because I'm obeying the rules, I'm obeying the law.

What is going to prevent this miserable facility from being permitted to go into the first day of its 61st year when it's collapsing?

MR. ROGERS: Well, I would -- I think that I would not start with that hypothesis.

MEMBER SKILLMAN: I would.

MR. ROGERS: Okay.

MEMBER SKILLMAN: I can give you stories, because I spent a lot of years out there after I left running engineering in a nuke, and I will tell you there are people who do not take care of their machine. They let them fall apart and they only get religion when they are on the cusp of 95003 or 0350. That wakes them up real fast. But it normally takes that to get their attention.

So I'm kind of -- I'm being a contrarian on purpose. I would like to spark this conversation because at least I envision the potential for a licensee to make a timely application under what, Part 2109 or 12103? And now here we are with a plant that really is into the first day of its 60th year and -- or 61st year and it really has not done any preparation. What prevents that?

MR. BLOOM: I think the answer is something that George said before. Since we're always watching the material condition of a plant, if they are in such a bad condition as you are describing, I don't believe the NRC is going to allow them to get to

60 years regardless of whether they have an application in. There will be numerous inspections and 350. I mean, we are just going to do a lot of other stuff that would almost shut the plant down before then.

MR. WILSON: This is George Wilson to add onto what you're saying. So one of the key components of the revised oversight process is the Corrective Action Program being very dynamic and very proactive.

MEMBER SKILLMAN: And effective.

MR. WILSON: And effective. That is the key. So what would happen during the performance evaluation of a licensee, we would identify several issues if the condition of the plant was that way. They should be put into the Corrective Action Program. Then the Corrective Action Program would be evaluated during the problem identification resolution associated with each one of the inspections.

If a licensee would then no longer -- they weren't implementing the corrective actions, they would get crosscutting issues in the corrective actions where it could lead to -- one of the basic statements in the revised oversight process is that a licensee, as you stated, has to have a very proactive effective Corrective Action Program. If they do not,

you have to evaluate whether or not they can stayed in a revised oversight process. And so that would be something that would be done by the regions on the -- you would have to evaluate that if they were not taking corrective actions the way they were supposed to be.

MEMBER SKILLMAN: This is a yes or no question: If a plant is in that situation, and I would say it's probably a 95003 --

(Simultaneous speaking.)

MR. WILSON: Well, it could be worse in a 95003. We don't -- so if you would get --

MEMBER SKILLMAN: Well, George, let me finish my question. The reason I used 95003 is that can still be operating at power and being in 95003. 0350 they fall -- they've lost their keys.

MR. WILSON: That's correct.

MEMBER SKILLMAN: So they still have -- they're still operating in 95003. There are real problems, whether administrative or material condition problems. And in that condition can they successfully apply for timely license renewal, or can they get permission to proceed with their application if they are in that situation? It's a yes or no.

(No audible response.)

MEMBER SKILLMAN: I'd like to have an answer to that question.

MR. WILSON: Right. I mean, I'd have to look at the conditions and what the -- I mean, legally we're bound by regulations. I have to see how the regulations lie. And I'm -- also have a performance part. So you're asking a question that has a legality portion of it, not --

MEMBER SKILLMAN: It does.

MR. WILSON: -- just an operations.

MEMBER SKILLMAN: It does.

MR. ROGERS: So for the legality portion I have to go back and look and talk to OGC. For the performance-based I couldn't see how the quality of the submittal that they would submit to my staff in the Division of License Renewal would be acceptable based on the performance of the plant and the condition. Then we would deny it. We would not accept that license renewal submittal based on the conditions that you just gave me, as me acting as the director of DLR.

MEMBER SKILLMAN: Okay. I kind of had a hunch that that would be the answer, but that tells me that if you chose to not accept that application because it is not acceptable, then they may not

proceed to that step.

MR. WILSON: They would probably potentially shut down when that -- they would have to shut down when that license come in. That would be a decision that would be evaluated at very high levels, but that would be based on what you -- my call would be I wouldn't accept this. You're going to have to do this. And we'd brief up.

MEMBER SKILLMAN: Okay. And please understand that the basis of my question is not to be punitive. It's to have organized thought about, if you will, inadvertent entry into the PEO for subsequent license renewal without having sufficient overview.

MR. WILSON: Right, and that was one of the keys where I said it's all performance-based. In the performance you're giving me, that licensee doesn't have it for me to --

MEMBER SKILLMAN: Yes.

MR. WILSON: -- have the reasonable assurance.

MEMBER SKILLMAN: Thank you. Billy, back to you.

MR. ROGERS: Thank you. I've completed my portion of the presentation.

MEMBER SKILLMAN: Okay. Thank you.

Everybody just freeze. Colleagues, do you have any further questions for the members from the staff?

MEMBER KIRCHNER: I have a comment.

MEMBER SKILLMAN: Please, Walt.

MEMBER KIRCHNER: Bill, on your slides that show the timeline, I'm in the middle of the second PEO of myself and you're showing accelerated aging there. So could I ask you in the future to extend that? It's not -- you see what you're timeline is doing? It's compressing. And I'm looking at time dilation.

(Laughter.)

DR. HISER: Yes, thank you. We were just putting everything on the slide. That's a good point though. We were just trying to put it on the slide.

MEMBER SKILLMAN: Thank you, Walt.

Any other questions from the ACRS members, please?

(No audible response.)

MEMBER SKILLMAN: If none, are there any comments from anybody in the room, please? If so, please come to the microphone and identify yourself and raise your comment or question.

(No audible response.)

MEMBER SKILLMAN: Seeing none, good afternoon on the phone line. This is the ACRS. The topic is subsequent license renewal. If anybody is out there, would you just simply acknowledge that you are there?

CHAIRMAN BLEY: Just go ahead, Dick. It's open.

MEMBER SKILLMAN: Is anybody there, please?

MS. CLARK: Yes, this is Phyllis Clark.

CHAIRMAN BLEY: You can just ask for comments at this point.

MS. CLARK: Yes, this is Phyllis Clark, CLR.

MR. XIU: And Bob Xiu, CLR.

MEMBER SKILLMAN: Thank you. For those of you that --

(Simultaneous speaking.)

CHAIRMAN BLEY: You don't all need to check in. Thank you.

MEMBER SKILLMAN: Thank you. For those of you who are out there, does anybody wish to make a comment, please?

(No audible response.)

MEMBER SKILLMAN: Hearing none, thank you. We'll close the phone line.

Dennis, back to you, sir.

CHAIRMAN BLEY: Thank you very much, Dick.

We are at this point off the record.

(Whereupon, the above-entitled matter went off the record at 5:04 p.m.)

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Protecting People and the Environment

Design of the Highly Integrated Protection System Platform

Presentation to the ACRS
Full Committee

April 6, 2017
(Open Session)

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Protecting People and the Environment

Agenda

- Background
- High-Level Description of the HIPS Platform
- Safety Evaluation Scope
- Regulatory Conformance

Background - Timeline

Date	Activity
December 2015	Topical Report (TR) 1015-18653-P submitted for review
February 2016	NRC Accepted TR for Review
June 2016	NRC Sent RAIs
July 2016	First Audit at NuScale's Rockville Office
August 2016	NuScale Sent Response to RAIs
November 2016	Revision 1 of TR docketed
January 2017	Draft Safety Evaluation Issued
January 2017	Second Audit at Ultra Electronics (Wimborne, UK)
February 2017	ACRS Subcommittee Meeting
March 2017	Issuance of Final Safety Evaluation
April 2017	ACRS Full Committee Meeting

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HIPS Platform

- The HIPS platform is composed of logic implemented using discrete logic and field programmable gate array (FPGA) technology
- The HIPS platform consists of the HIPS chassis and a system of modules
  - Safety Function Module (SFM)
  - Communications Module (CM)
  - Equipment Interface Module (EIM)
  - Hardwired Module (EIM)

SE Review Scope

- The scope of the review was focused on:
  - Fundamental I&C design principles
    - Independence
    - Redundancy
    - Predictability and Repeatability
    - Diversity and Defense in Depth
  - Calibration, testing, and diagnostics capabilities of the HIPS Platform

Regulatory Conformance

- The HIPS platform design supports meeting the applicable regulatory requirements associated with the fundamental I&C design principles.
- 65 ASAIs have been established to identify criteria that should be addressed by applicants or licensees referencing this SE.
  - Quality Assurance
  - Equipment Qualification
  - Secure Development Process
  - MWS and PS Gateway
  - Human-Machine Interface
  - Displays

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Questions

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Acronyms

- ACRS: Advisory Committee on Reactor Safeguards
- ASAI: application-specific action item
- CM: Communication Module
- EIM: equipment interface module
- ESFAS: engineering safety features actuation system
- FPGA: field programmable gate array
- HIPS: highly integrated protection system
- HWM: Hard-Wired Module
- I&C: instrumentation and control
- ISM: Input Sub-Module
- MIB: Monitoring and Indication Bus
- MWS: maintenance workstation
- NRC: U.S. Nuclear Regulatory Commission
- RAI: request for additional information
- RTS: reactor trip system
- SDB: Safety Data Bus
- SBM: scheduling and bypass module
- SFM: safety function module
- SE: safety evaluation
- SVM: scheduling and voting module
- TR: topical report

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Backup Slides

Populated HIPS chassis with the trip/bypass plate

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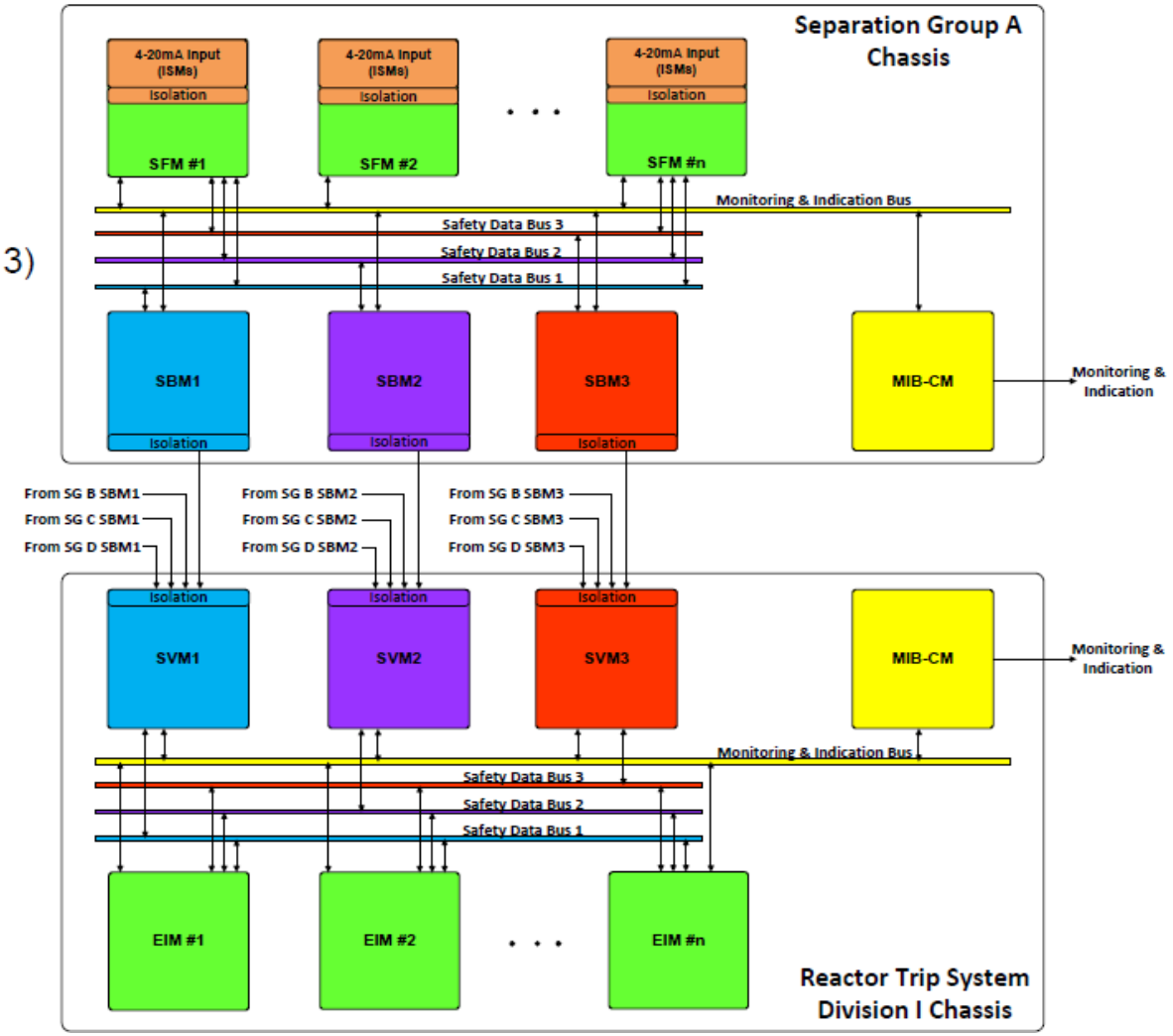
High Level Representative Architecture Safety Data Paths

- Safety Data Paths (1, 2, 3)
- Safety Data Path 1
- Safety Data Path 2
- Safety Data Path 3
- Monitoring and Indication Path



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Independence

- Physical Independence
- Electrical Independence
- Communications Independence
- Functional Independence

The staff finds that the TR provides information sufficient to support conformance with the independence requirements in RG 1.75, RG 1.152, RG 1.53, and DI&C-ISG-04, or establishes ASAIs as necessary to fully comply with the regulatory requirements for an applicant or licensee referencing this SE.

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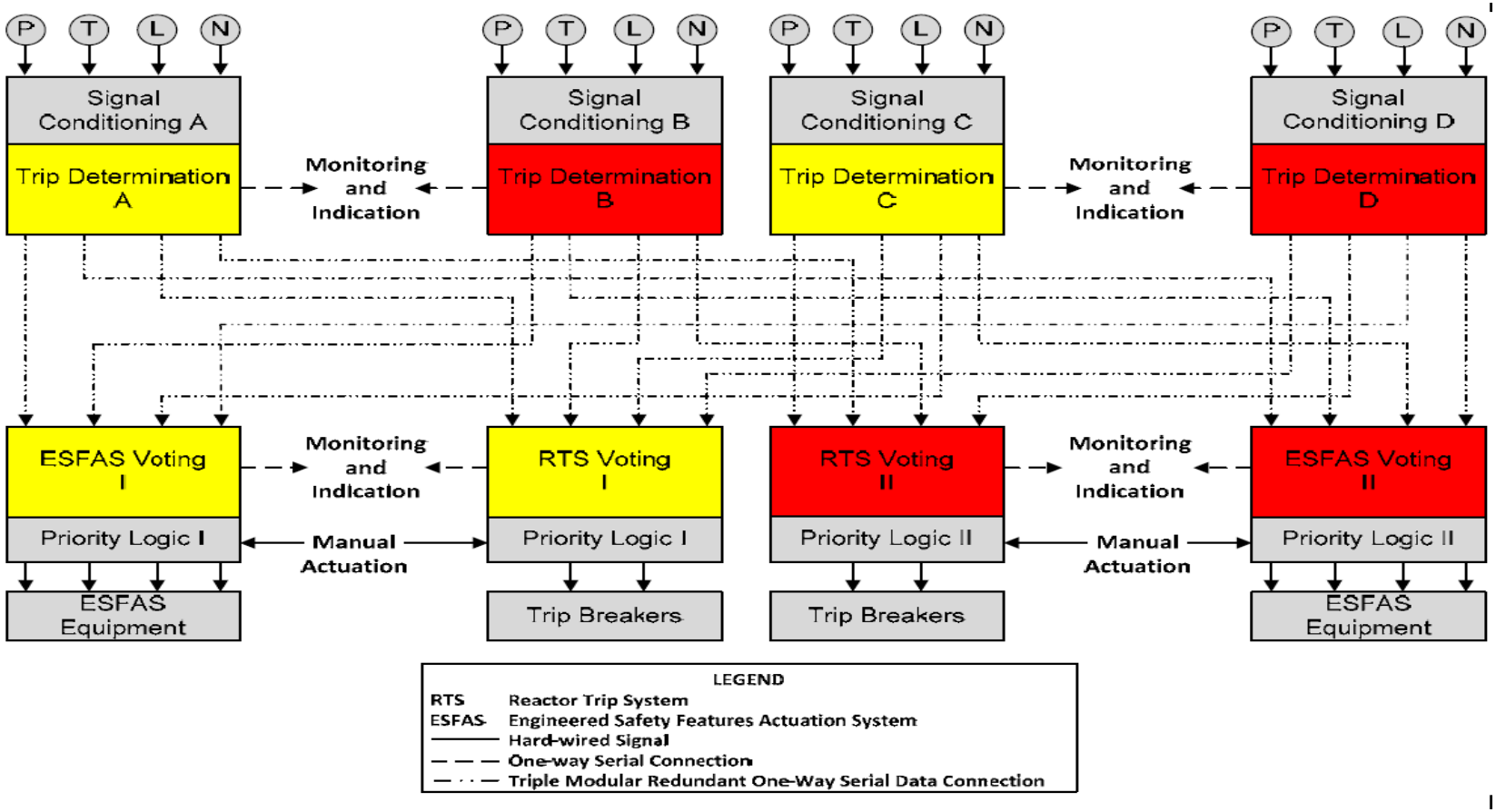
Redundancy

- Power Supply Redundancy
- Safety Module Redundancy
- Communication Redundancy
- Equipment Interface Redundancy
- Platform Redundancy

The staff finds that the TR provides information sufficient to support conformance with the regulatory requirements on the single failure criterion in RG 1.53, or establishes ASAIs as necessary to fully comply with the regulatory requirements for an applicant or licensee referencing this SE.

Diversity

FPGA Equipment Diversity Allocation in a Representative Architecture



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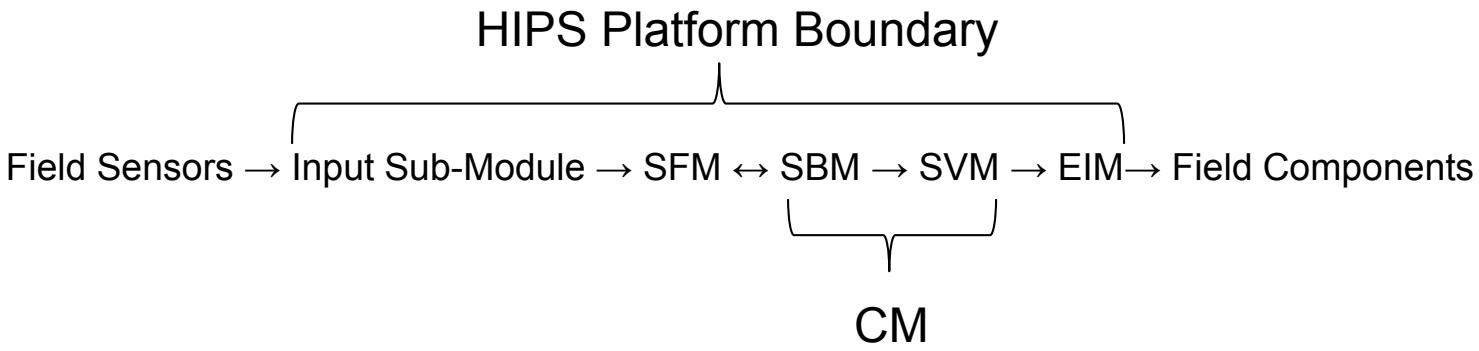
Diversity

Effects of Digital CCF for HIPS Diversity Strategy

Event	Module	A	C	B	D
Transient or accident (no CCF)	SFM	✓	✓	✓	✓
	CM	✓	✓	✓	✓
	EIM	✓	✓	✓	✓
Transient or accident with CCF (Case 1 – equipment (FPGA) and module functional diversity)	SFM	×	×	✓	✓
	CM	✓	✓	✓	✓
	EIM	✓	✓	✓	✓
Transient or accident with CCF (Case 2 - equipment (FPGA) diversity)	SFM	×	×	✓	✓
	CM	×	×	✓	✓
	EIM	×	×	✓	✓

Predictability and Repeatability

Typical plant signal data flow path in HIPS platform



Calibration, Testing, and Diagnostics Capabilities

- Section 8, “Calibration, Testing, and Diagnostics,” of the TR describes the diagnostics and maintenance features provided by HIPS platform and directly addresses IEEE Std 603-1991 Clause 5.7.
- These features include the use of BIST, CRC checks, periodic surveillance testing, and other tests in each type of module as appropriate to verify normal operation.

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Subsequent License Renewal (SLR) Guidance Documents and Optimization of the SLR Safety Review Process

Advisory Committee on Reactor Safeguards (ACRS)
Full Committee Meeting
April 6, 2017
Division of License Renewal
Office of Nuclear Reactor Regulation

Agenda

U.S.NRC
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- Background
- SLR Guidance Documents
  - Overview of changes to GALL-SLR Report and SRP-SLR
  - Status
- Optimization of SLR Review Process
  - Safety Review
  - Implementation of Activities for SLR

Background

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- Part 54 to Title 10 of the *Code of Federal Regulations,* License Renewal Rule
- Staff proposed options for changes to Part 54 for SLR (60-80 years) in SECY 14-0016
- Commission did not approve staff's recommendation to initiate rulemaking in SRM to SECY 14-0016
- In December 2015, draft guidance documents issued for public comment – comment period ended February 29, 2016
- In 2016, staff held numerous public meetings and addressed public comments
- Staff has prepared final guidance documents for issuance

Staff Interactions with ACRS

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- Subcommittee meeting – April 8, 2014
- Full committee meeting – May 8, 2014
- ACRS Letter to Commission – May 22, 2014
- Subcommittee meeting (SLR research on technical issues) – November 17, 2015
- Subcommittee meeting – February 17, 2016
- Subcommittee meeting – March 23, 2017
- Full committee meeting – today

SLR Significant Technical Issues

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- Neutron embrittlement of the reactor pressure vessel at high fluence
- Stress corrosion cracking of reactor internals and primary system components
- Concrete and containment performance after long-term irradiation and high temperature exposure
- Environmental qualification, performance, and inservice testing of cables

Safety Continues to be Maintained Beyond 60 Years

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- License renewal principles are effective to ensure safety
  - Regulatory process ensures that the current licensing basis provides and maintains an acceptable level of safety
  - Each plant's licensing basis must be maintained
  - Additional focus on management of aging effects of in-scope passive, long-lived structures and components

Regulations and Processes Ensure Safe Operation for SLR

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- License renewal regulations ensure passive, long-lived structures and components perform intended functions during the subsequent period of extended operation (PEO)
- Subsequent license renewal application (SLRA) review includes environmental and safety reviews, and audits
- Continuous verification of plant safety through reviews and the Reactor Oversight Process (ROP)

SLR Guidance

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- Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report (NUREG-2191)
  - Provides generic evaluation of aging effects to be managed and appropriate aging management programs (AMPs)
  - Identifies acceptable method to manage aging effects
    - Plant-specific alternatives may be proposed and reviewed
- Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (SRP-SLR) (NUREG-2192)
  - Provides guidance to NRC staff reviewers to perform safety reviews of the SLRA

Development of SLR Guidance Involved Rigorous Staff Review

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- Technical sources used for SLR guidance
  - Expanded Materials Degradation Assessment
  - AMP effectiveness audits
  - Relevant domestic and international operating experience
  - External stakeholder, staff comments

Refinements to Guidance Support 80 Years of Operation

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- New GALL-SLR Report AMPs
  - Fluence Monitoring
  - High Voltage Insulators
- Modified approach to aging management for reactor vessel internals for pressurized water reactors (PWRs)
- Modifications to Reactor Vessel Materials Surveillance AMP

Changes include Revisions to Reactor Vessel Material Surveillance AMP

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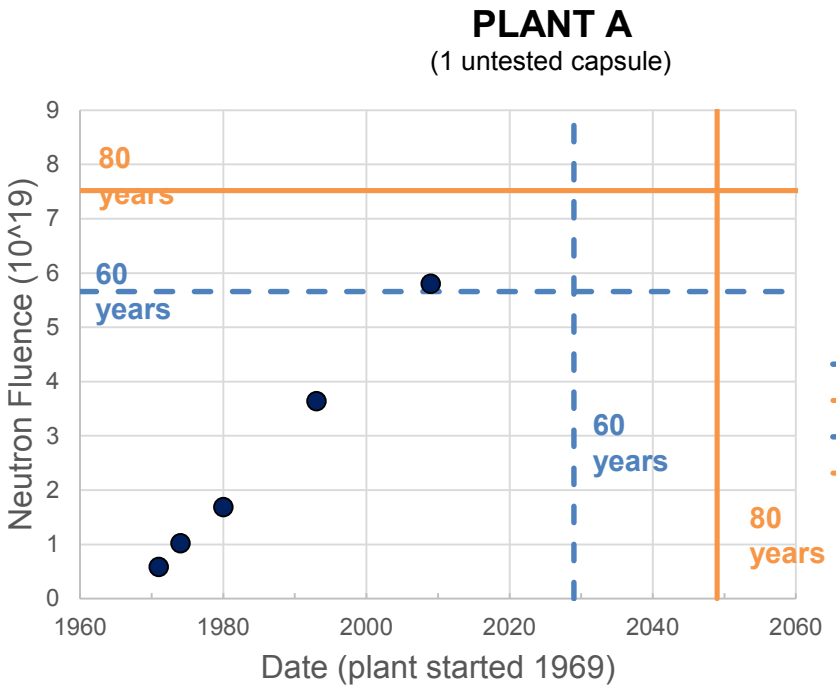

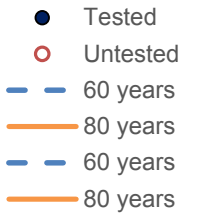

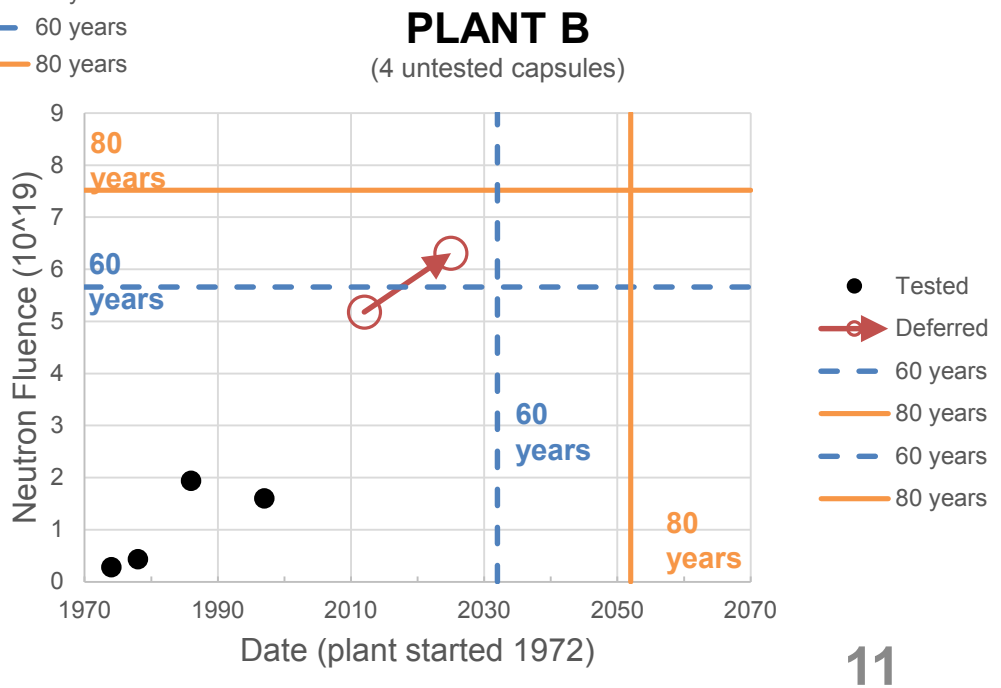

Changes Include Revisions to Electrical and Structural AMPs

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- Expanded Electrical Insulation of Cables AMP from one AMP to three AMPs to address aging of submerged cables at different voltages

- Aging management of concrete
  - Updated for alkali-silica reaction (ASR)
  - Added further evaluation for irradiation of concrete

Overview of Changes to SRP-SLR

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- Eliminated some plant-specific further evaluations by pointing to a generic AMP
- Added aging management review (AMR) line items for new material, environment, aging effect and AMP combinations
- Broadened Section 4.3, Metal Fatigue, to provide guidance for all cyclical loading analyses
- Added table of potential plant-specific time-limited aging analyses (TLAAs) (Section 4.7)

Overview of Changes to SRP-SLR

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- New Chapter 5 on Technical Specification changes and additions that may be required for aging management
- Added new appendix on review of operating experience for AMPs
- Added detailed Final Safety Analysis Report Supplement summary descriptions in GALL-SLR Report and SRP-SLR

Readiness to Review SLRAs

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- GALL-SLR Report AMPs address technical issues
- For a few technical issues, no generic approach to address aging, and will require plant-specific further evaluations
- Applicant's responsibility to evaluate technical issues, develop adequate aging management methods
- NRC is prepared to review SLRAs

SLR Guidance Schedule

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Timeframe	Description
April 26, 2017	• Commission Meeting on SLR
July 2017	• Issuance of final GALL-SLR Report and SRP-SLR NUREGs
December 2017	• Issuance of Technical Bases and Public Comments NUREGs
2018	• SLRA – Peach Bottom
2019	• SLRA – Surry

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SLR Optimization

SLR Optimization Presentation Topics

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- Subsequent License Renewal Optimization Working Group (SLRO-WG) Purpose, Areas Evaluated and Communications

- SLRO-WG Results for SLRA Safety Evaluation Reports (SER), ACRS Meetings and Review Timeline

- Implementation of Activities for SLR

SLRO-WG Purpose, Areas Evaluated, and Communications

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- SLRO-WG Purpose
  - SLRO-WG was established to evaluate the SLRA review process to identify areas where the process could be made more efficient and effective and to optimize the staff's performance relative to timeliness, application of staff resources and quality of products.

- Areas Evaluated and Stakeholder Communications
  - SLRO-WG evaluation included both safety and environmental project management tools, audits and inspections, the SERs and the SLRA review timeline.
  - SLRO-WG presented proposed staff positions to industry and stakeholders during several public meetings and considered comments.

SLRO-WG Recommendations Safety Review and ACRS Meetings

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- SLRA Review Timeline
  - SLRA review timeline goal, for both safety (SER) and environmental (EIS) reviews, will be eighteen months (without a hearing), which will begin at the completion of the acceptance review.
- Draft Safety Evaluation Report
  - Staff intends to present a draft Final SER to the ACRS Subcommittee and a draft Final SER to the ACRS Full Committee (revised as necessary).
- ACRS Subcommittee and Full Committee Scheduling Request
  - Staff will request scheduling of the ACRS Subcommittee meeting and ACRS Full Committee meeting to occur in consecutive months.

Implementation of Activities for SLR – Agenda

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- Inspection/Audit Timeline for License Renewal and SLR
- Purpose of IPs 71002, 71003
- Crosswalk of Activities for SLR
- Assurance of Implementation of Activities for SLR

LR Inspection/Audit Timeline

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AMP Audit
- 3-5 months after LRA received
- 30 auditors to review most AMPs and verify consistency with GALL

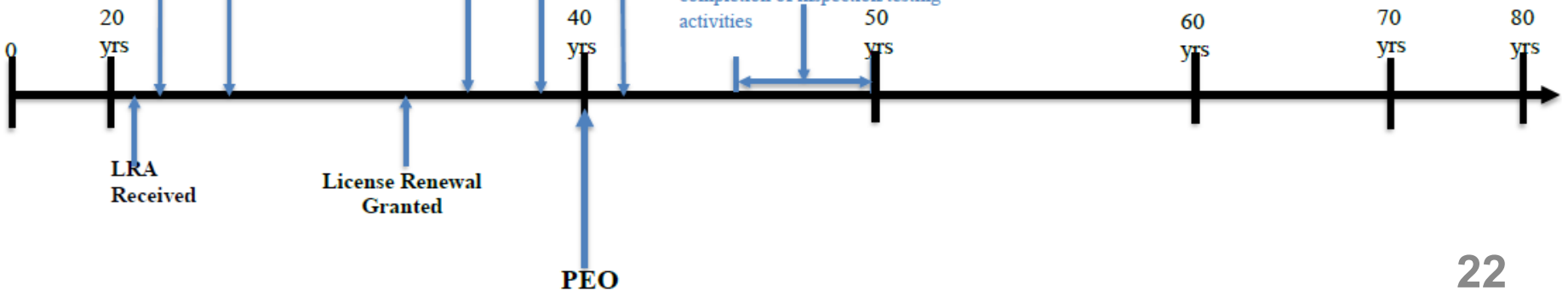
1st IP 71002
- 9-11 months after LRA received
- 5-6 inspectors to review most AMPs to assess applicant's plans to implement AMPs, and evaluate effectiveness of implementation activities

1st IP 71003, Phase 1
- After renewed license approved
- During the last outage prior to PEO to review aging management activities in inaccessible areas

1st IP 71003, Phase 2
- After renewed license approved
- 3-6 months prior to PEO to verify AMPs implemented and inspection/testing activities completed

1st IP 71003, Phase 3
- After renewed license approved
- 1 year into PEO to review aging management activities, follow up on issues

1st IP 71003, Phase 4
- After renewed license approved
- 5-10 years into PEO to verify AMP effectiveness, and completion of inspection/testing activities



SLR Inspection/Audit Timeline

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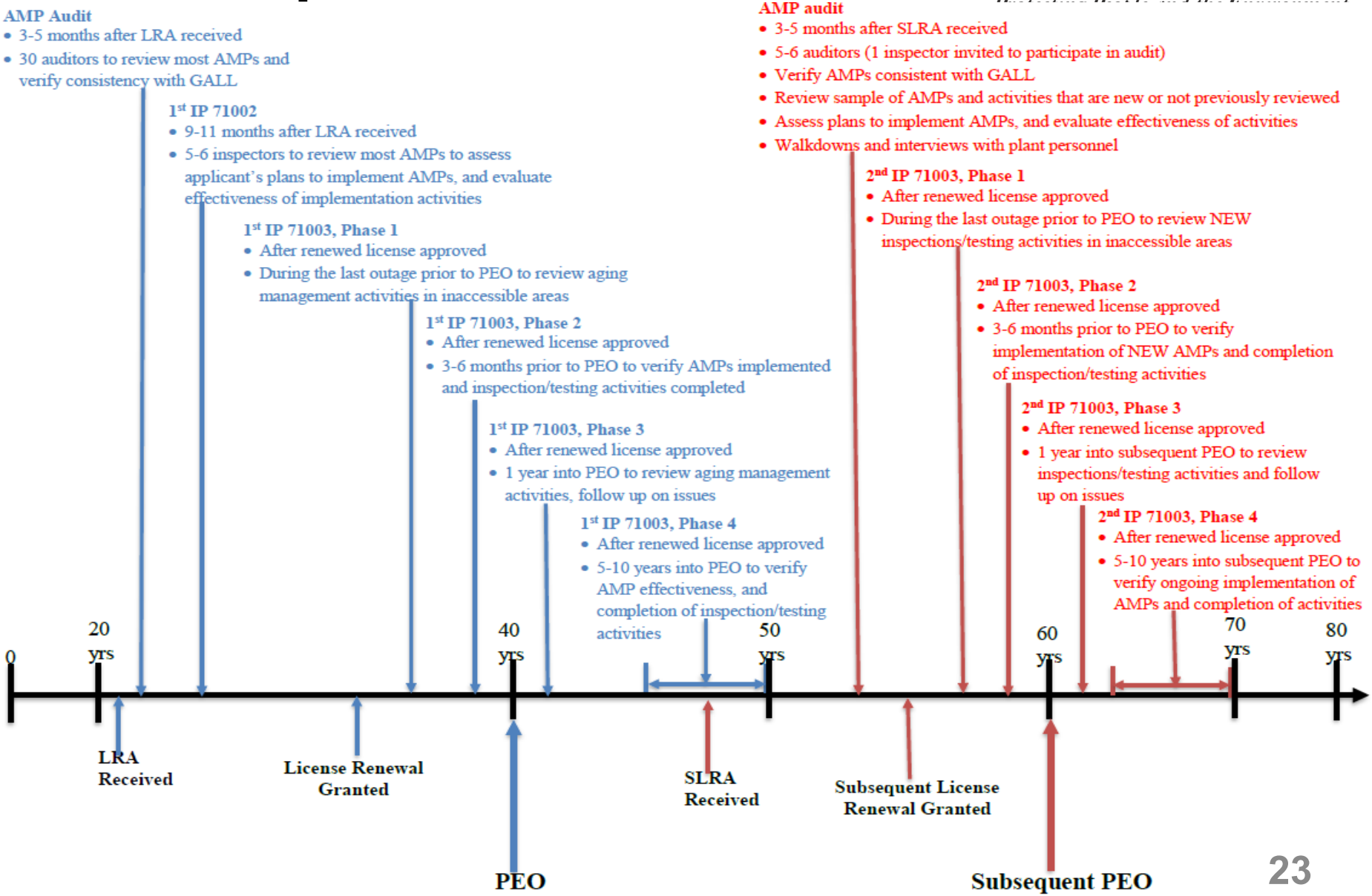

Purpose of IP 71002

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- Performed during license renewal application review, approximately 11 months after receipt of a license renewal application (license not yet renewed)
- Pre-renewal inspection
- Verify processes for Scoping and Screening
- Assesses applicant's plans to implement AMPs
  - Walkdowns to observe aging effects
  - Review past tests and inspections
- Verify applicant's Operating Experience review

Purpose of IP 71003

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- Post-Approval Site Inspection for License Renewal
- Verify implementation of AMPs
- Verify completion of activities such as, inspections, tests, and analyses
- Verify license conditions met
- Verify changes to commitments, conditions, and UFSAR in accordance with regulations
- Verify readiness to enter PEO

Phases of IP 71003

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- Performed after approval of renewed license
  - Phase 1: Last outage prior to PEO, review inspections and tests in inaccessible areas
  - Phase 2: 3-12 months prior to PEO, verify AMP implementation, completion of activities
  - Phase 3: 1-2 years into PEO, follow up issues identified during Phase 2, activities completed
  - Phase 4 (New): 5-10 years into PEO, verify licensee managing aging effects in accordance with AMPs, ensure SSCs maintain ability to perform their intended function(s)

Crosswalk of Activities Assure Functions Accomplished for SLR

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Functions of the License Renewal Application Review	Accomplished during License Renewal by	To Be Accomplished during SLR by
Plant walkdowns and review of material condition of plant	IP 71002, AMP Audit, IP 71003, ROP Baseline inspections	AMP Audit, IP 71003, ROP Baseline inspections
Interviews with plant personnel	IP 71002, AMP Audit, IP 71003, ROP baseline inspections	AMP Audit, IP 71003, ROP baseline inspections
AMP evaluation	IP 71002, AMP Audit, IP 71003	AMP Audit, IP 71003
Scoping and Screening Review	IP 71002, Scoping and Screening Audit	AMP Audit
Operating Experience Review	IP 71002, Scoping and Screening Audit	AMP Audit
Observations identified and documented in reports	IP 71002, AMP Audit, safety evaluation report, IP 71003, ROP baseline inspections	AMP Audit, safety evaluation report, IP 71003, ROP baseline inspections

ROP Updated to Include Aging Management Inspection Guidance

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- Baseline inspection procedures in the ROP updated to incorporate aging management inspection guidance include:
  - IP 71111.04 Equipment Alignment
  - IP 71111.06 Flood Protection Measures
  - IP 71111.07 Heat Sink Performance
  - IP 71111.11 Inservice Inspection Activities
  - IP 71111.12 Maintenance Effectiveness
  - IP 71111.21 Component Design Bases Inspection
  - IP 71152 Problem Identification and Resolution

Summary of SLR Optimization

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- We are developing a more efficient process for reviewing all aspects of an SLRA and conducting audits and inspections to assure the applicant's ability and readiness to implement AMPs
- License renewal functions sufficiently assessed for SLR
- HQ and Regions will work together to ensure audits and inspections are tailored to plant-specific needs
- Audits and inspections will provide reasonable assurance of continued safe plant operation for 80 years